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KERNERSVILLE THOROUGHFARE PLAN

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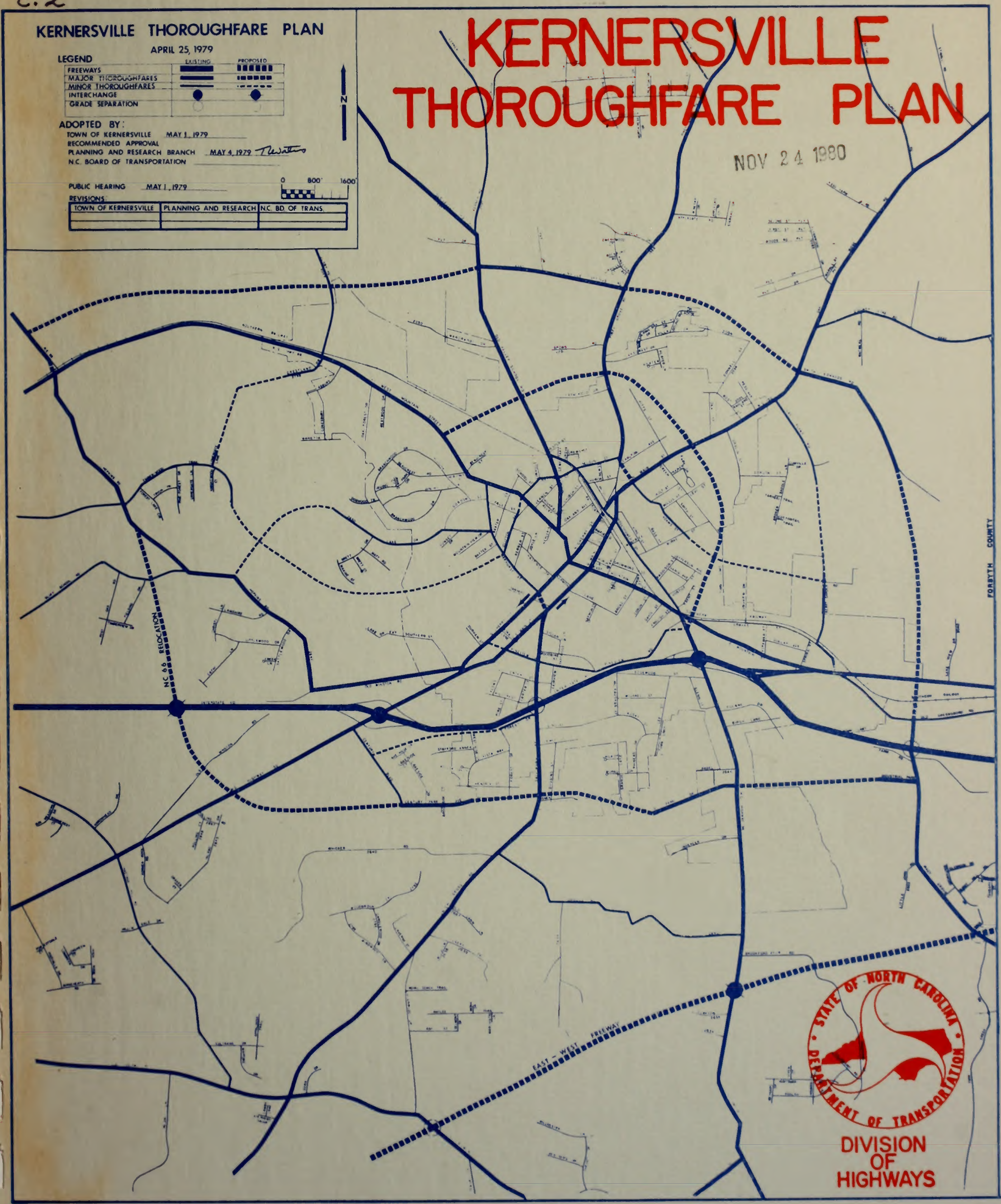

KERNERSVILLE THOROUGHFARE PLAN

APRIL 25, 1979

LEGEND

	EXISTING	PROPOSED
FREEWAYS	▬	▪▪▪▪▪▪
MAJOR THOROUGHFARES	▬	▪▪▪▪▪▪
MINOR THOROUGHFARES	─	------
INTERCHANGE	●	●
GRADE SEPARATION	○	○

ADOPTED BY:
TOWN OF KERNERSVILLE MAY 1, 1979
RECOMMENDED APPROVAL
PLANNING AND RESEARCH BRANCH MAY 4, 1979 TWaters
N.C. BOARD OF TRANSPORTATION

PUBLIC HEARING MAY 1, 1979

REVISIONS

TOWN OF KERNERSVILLE	PLANNING AND RESEARCH	N.C. BD. OF TRANS.

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

DIVISION OF HIGHWAYS

NOV 24 1980

Preliminary Thoroughfare Plan
for
Kernersville, North Carolina

Prepared by:

The Planning and Research Branch of the
Division of Highways of the North
Carolina Department of Transportation
and
City-County Planning Board for
Winston-Salem and Forsyth County, North Carolina

In cooperation with:

The Town of Kernersville
The City of Winston-Salem
Forsyth County
The Federal Highway Administration of
the United States Department of Transportation

August, 1980

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DIVISION OF HIGHWAYS

August 1, 1980

The Honorable Roger P. Swisher, Mayor
Members of the Kernersville Board of Aldermen
Members of the Kernersville Planning Board
Kernersville, North Carolina

Dear Board Members:

We are pleased to submit our report on the Kernersville Thoroughfare Plan giving the background data and analysis used in development of the Plan. The plan has been developed as a guide for solving existing and anticipated traffic problems in the Kernersville area. The basis of this plan was a series of traffic, population, and land use studies of the area.

It is emphasized that the Plan is a balanced network and the effectiveness of any portion of the plan is largely dependent upon the eventual development of the entire system. It should be emphasized that any major change in land use patterns or traffic growth may require revisions in the plan.

Cordially yours,

Billy Rose

Billy Rose
State Highway Administrator

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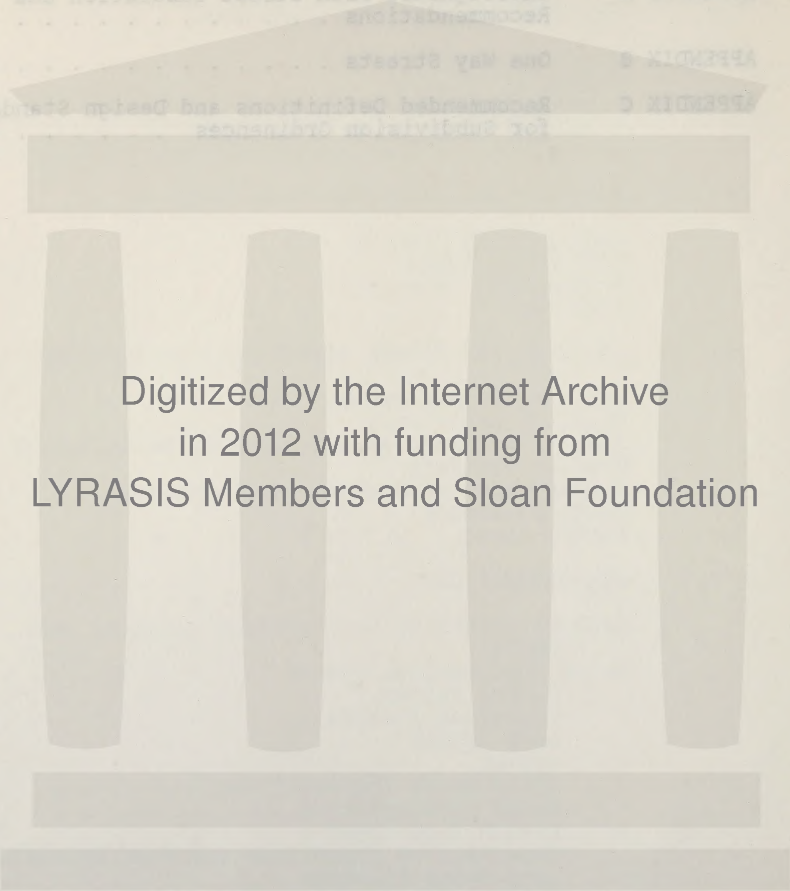

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I. INTRODUCTION

Highway transportation plays a vital role in our nation's economy. The automobile has come to be a necessity rather than a luxury. Just about every activity in our day to day living involves the use of the motor vehicle. We rely on the family car to carry us to and from work, shopping, and social events, to carry our children to school, and to assist in other activities of our daily lives. We depend on trucks to deliver our goods and services and have become so accustomed to the motor vehicle that we almost take it for granted.

The automobile has helped us solve many of our problems but at the same time has created others, such as congestion and air pollution. By increasing our mobility, the automobile has enabled us to live further away from the central business area while we still enjoy the benefits of downtown. Despite the popularity of suburban shopping centers, most of us still depend on the central core to provide jobs and major services.

This trend in suburban living has created some major transportation problems. For instance, highways are needed to connect the suburban areas with downtown and also with other suburban areas. As the population increases and the urban area expands, the need for more streets and highways, and more downtown parking grow. The dependence on the motor vehicle as our primary transportation for persons and goods in our urban area has been made the economy of our communities heavily dependent on an efficient street network.

Unless the transportation demands of our communities can be adequately met, their economic vigor is liable to falter. A community's transportation system is somewhat analagous to the circulatory system of the human body--any breakdown or disruption is dangerous to either.

Within the last decade, much effort has been put forth in the field of highway transportation planning. The use of the motor vehicle has grown at a faster pace than has highway construction, a situation which means that we have a lot of "catching up" to do. At the same time that we are struggling to meet present demands, time and effort must also be devoted to planning, and preparing, for facilities to cope with future needs.

The following thoroughfare plan outlines a coordinated network of major streets and highways, secondary streets and collector streets to serve as a guide for the future development of the Kernersville street system.

The Kernersville Thoroughfare Plan was developed following the basic thoroughfare planning principles as discussed in Chapter II of this report. The adopted plan for the Kernersville Area (Figure 8) was developed through coordination with the Town of Kernersville, Winston-Salem/Forsyth County Planning Board and the North Carolina Department Transportation. It was based on very general traffic, population, land use and economic data. An analysis of existing traffic was done on the basis of historical growth patterns established by traffic counts taken over several years. Major thoroughfares were located based on field investigations, existing and projected land uses, and topographic conditions. The plan sets forth those improvements which are expected to be necessary for proper traffic circulation within the planning area.

Some of the proposed improvements will be the responsibility of the Division of Highways, while the city will be responsible for other improvements. With the different governmental units involved in developing the thoroughfare system, coordination is of prime importance. At the writing of this report the Recommended Plan (Figure 8) has been adopted by both the local governing body and the Board of Transportation to serve as a mutual, official guide in the development of the thoroughfare system.

In order for the Plan to be effective, it is essential that the Town use legal controls, such as subdivision regulations to protect the rights-of-way necessary for the improvements which will be ultimately required.

It should be emphasized that the Plan is based on the anticipated growth of the urban area as indicated by current trends. If actual growth rates and patterns differ from those anticipated, it may become desirable to accelerate or retard the development of the system or to make adjustments in the Plan commensurate with variations in the anticipated development.

Initial work to have a adopted thoroughfare plan begun in 1965 with a sketch plan developed in 1967. A report on the recommended plan was prepared in the same year. In 1968 adoption of a thoroughfare was held up due to location of the northern inner loop. A consultant was obtained in 1972 by the Town of Kernersville to do a land use and thoroughfare plan. This revised thoroughfare plan moved the inner loop of the 1967 plan out and included a freeway south of the town and a NC 66 relocation. This plan was not mutually adopted by the town and the state.

The end of 1978 saw a reviewing of the need for a mutually adopted plan for the Kernersville area. Extensive coordination between the Winston-Salem/Forsyth County Planning Board, Town of Kernersville and the North Carolina Department of Transportation led to a mutually adopted thoroughfare plan for the Kernersville area. The Town adopted the plan on May 4, 1979 and the North Carolina Board of Transportation adopted the plan on June 8, 1979. The adopted plan used previous studies, plans, and the above mentioned data in the preceeding paragraphs to develop a plan that could be used for planning of future roads, land use and town services (water, sewer).

[illegible] land use and economic data. An analysis of ex[illegible] was done on the basis of historical growth patterns [illegible] by traffic counts taken over several years. Major [illegible] were located based on field investigations, estimates of projected land uses, and topographic conditions. The plan sets forth those improvements which are expected to be necessary for proper traffic circulation within the planning area.

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II. THOROUGHFARE PLANNING PRINCIPLES

Typically, the urban street system occupies 25 to 30 percent of the total developed land in an urban area. Since the system is permanent and expensive to build and maintain, much care and foresight are needed in its development. Thoroughfare planning is the process used by public officials to assure the development of the most appropriate street system to meet existing and future travel desires within the urban area.

The primary aim of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with changing traffic demands. Through proper planning for street development, many costly errors and much needless expense can be averted. A thoroughfare plan will enable street improvements to be made as traffic demands increase, and only such improvements necessary to meet these demands need be made. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, thereby requiring a minimum amount of land for street purposes. In addition to providing for traffic needs, the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial, and industrial enterprises, affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

- To provide for the orderly development of an adequate major street system as land development occurs;
- To reduce travel and transportation costs;
- To reduce the cost of major street improvements to the public through the coordination of the street system with private action;
- To enable private interests to plan their actions, improvements, and development with full knowledge of public intent;
- To minimize disruption and displacement of people and businesses through long range advance planning for major street improvements;
- To reduce environmental impacts such as air pollution, resulting from transportation;
- To increase travel safety.

Thoroughfare planning objectives are achieved through both (1) improving the operational efficiency of thoroughfares and (2) improving the system efficiency through system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry vehicular traffic and people. In terms of vehicular traffic, a street's capacity is defined as the maximum number of vehicles which can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic and weather.

Physical ways to improve vehicular capacity include street widening, intersection improvements, improving vertical and horizontal alignment, and eliminating roadside obstacles. For example, widening of a street from two to four travel lanes more than doubles the capacity of the street by providing additional maneuverability for traffic. Impedences to traffic flow caused by slow moving or turning vehicles and adverse effects of horizontal and vertical alignments are thus reduced.

Operational ways to improve street capacity include:

- Control of access - A roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane width and number.
- Parking removal - Increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.
- One-way operation - The capacity of a street can sometimes be increased 20-50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.
- Reversible lanes - Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.

- Signal phasing and coordination - Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

- Encourage people to form carpools and vanpools for journeys to work and other trip purposes. This reduces the number of vehicles on the roadway and raises the people carrying capability of the street system.
- Encourage the use of transit and the bicycle mode.
- Encourage industries, business, and institutions to stagger work hours or establish variable work hours for employees. This will reduce travel demand in peak periods and spread peak travel over a longer time period.
- Plan and encourage land use development or redevelopment in a more travel efficient manner.

System Efficiency

Another means for altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Functional Classification

Streets perform two primary functions--traffic service and land service, which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely used abutting property lead to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets which permits travel from origins to destinations with directness, ease, and safety. Different streets in the system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict. Streets are categorized as to function as local access streets, minor thoroughfares, or major thoroughfares (see Figure 1).

Local Access Streets provide access to abutting property. They are not intended to carry heavy volumes of traffic and should be located such that only traffic with origins and destinations on the streets would be served. Local streets may be further classified as either residential, commercial, and/or industrial depending upon the type of land use which they serve.

Minor thoroughfares are more important streets in the city system. They collect traffic from local access streets and carry it to the major thoroughfare system. They may in some instances supplement the major thoroughfare system by facilitating minor through traffic movements. A third function which may be performed is that of providing access to abutting property. They should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major thoroughfares are the primary traffic arteries of the city. Their function is to move intra-city and intercity traffic. The streets which comprise the major thoroughfare system may also serve abutting property; however, THEIR MAJOR FUNCTION IS TO CARRY TRAFFIC. They should not be bordered by uncontrolled strip development because such development significantly lowers the capacity of the thoroughfare to carry traffic and each driveway is a danger and an impediment to traffic flow. Major thoroughfares may range from a two-lane street carrying minor traffic volumes to major expressways with four or more traffic lanes. Parking normally should not be permitted on major thoroughfares.

Idealized Major Thoroughfare System

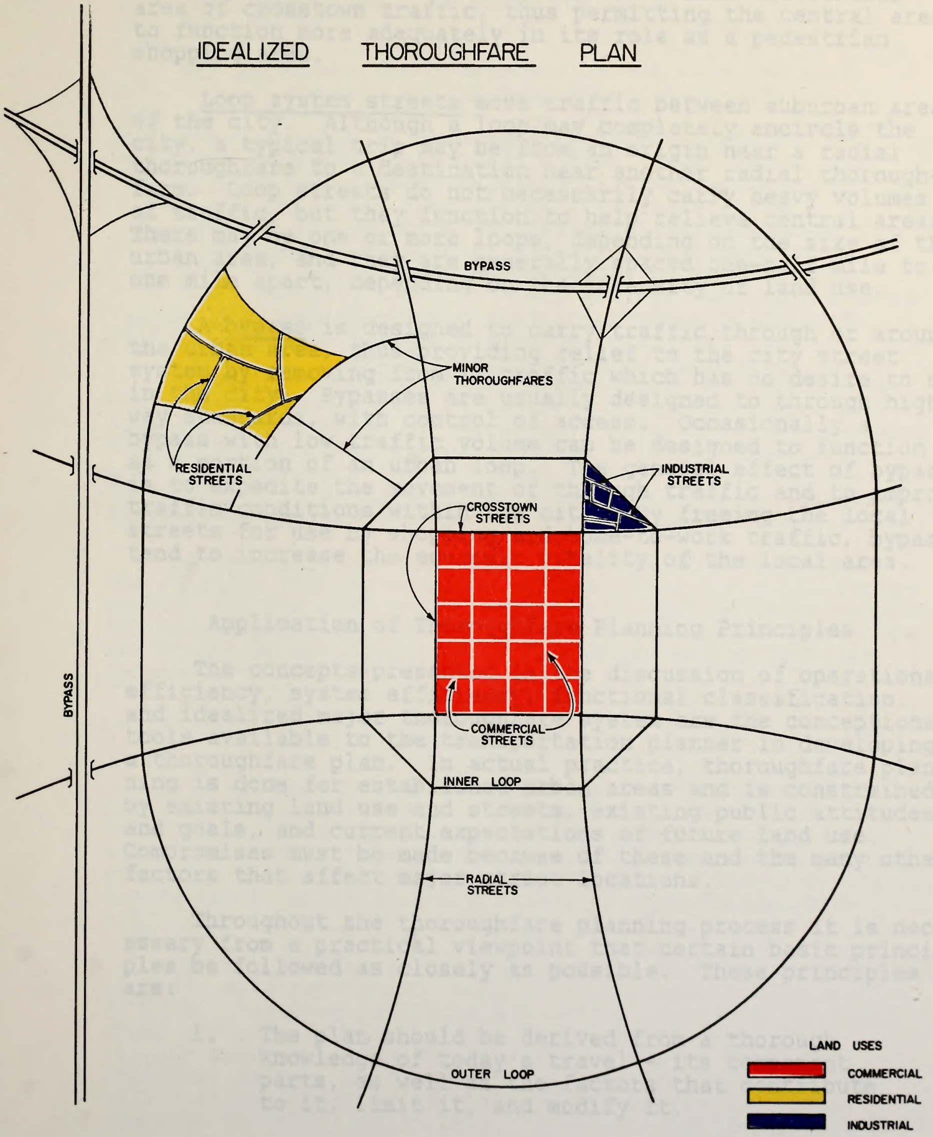
A coordinated system of major thoroughfares forms the basic framework of the urban street system. A major thoroughfare system which is most adaptable to desire lines of travel within an urban area and which permits movement between various areas of the city with maximum directness is the radial-loop system. This system consists of several functional elements-radial streets, crosstown streets, loop system streets, and bypasses (see Figure 1).

Radial streets provide for traffic movement between points located in the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of crosstown streets which form a loop around the central business district. This system allows traffic moving from origins on

FIGURE I

IDEALIZED THOROUGHFARE PLAN



one side of the central area to destinations on the other to follow the area's border and allows central area traffic to circle and then enter the area near a given destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function more adequately in its role as a pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. There may be one or more loops, depending on the size of the urban area, and they are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A bypass is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing from it traffic which has no desire to be in the city. Bypasses are usually designed to through highway standards, with control of access. Occasionally a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptional tools available to the transportation planner in developing a thoroughfare plan. In actual practice, thoroughfare planning is done for established urban areas and is constrained by existing land use and streets, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect major street locations.

Throughout the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are:

1. The plan should be derived from a thorough knowledge of today's travel - its component parts, as well as the factors that contribute to it, limit it, and modify it.

2. Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of all major traffic movements on a relatively few streets.

3. The plan should conform to and encourage the land development plan of the area.

4. Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas which have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect rights-of-way for future thoroughfare development.

5. While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

III. EXISTING AND PROJECTED CONDITIONS

Location and History

Compared to many small towns, Kernersville has been careful to plan its future. In 1971 the Kernersville Planning Board, with technical assistance from Batten Associates, published an analysis of Population, Economy and Existing Land Use. A year later, the Land Use and Major Thoroughfare Plan was approved. A draft Land Use Plan Update was published by Russell and Axon in October, 1979. Consequently, this section need only summarize data presented in those reports.

The area now known as Kernersville was originally called Dobson's Cross Roads. By 1871, when the town was incorporated, the name had been changed to Kernersville. Soon after incorporation, Southern Railway completed a track through the town which made the area attractive for both tobacco factories and textile mills.

As with many small towns, Kernersville's location has had a significant impact on its growth. Kernersville is located at the center of the cities: High Point - Greensboro - Winston-Salem. The regional highway network, especially I-40 and NC 66, provide excellent access. Consequently, Kernersville is attractive for both commercial and residential development related to any - or all - of the cities.

Kernersville has its own substantial industrial base. The original textile and tobacco industries are still represented, but the base has diversified to include other manufacturing, warehousing, and motor freight. NC 66 south of I-40 has become an especially concentrated center for trucking terminals.

Population Trends

One evidence of Kernersville's attractiveness is her rapidly growing population. Unfortunately annexations make detailed analysis impossible, but the general trends are still informative. Between 1960 and 1970 the town's population grew 64%, compared with 13% for all of Forsyth County. The township, which is not affected by annexations, grew 31%.

Current estimates indicate that the town has continued to grow, with population reaching approximately 6000 persons in 1978. Assuming continued annexation, recent projections shown almost a doubling in population by the year 2000 (11,400 persons). That growth rate is faster than the remainder of the County and by the year 2000 Kernersville will include almost 4% of the County's population. This compares to only 1.5% in 1969. (Source: Battan Associates).

Economy and Employment

Specific information on at-place employment is not available. Such data, and projections, will be prepared during 1980-81 as part of a Countywide transportation plan updata.

Land Use

Currently there are almost 1400 acres zoned for industrial use of which approximately half are vacant. Recent zoning decisions have tended to encourage development on land already properly zoned. The trend will increase the predictability of future land use patterns.

Industrial development has occurred in several areas. Adams-Millis (textiles) is located in the northeast along NC 150 and AMP (Electronics) has recently announced a new plant adjacent to Adams-Millis. NC 150 provides good access to US 220 and thereby north into Virginia. On the east, industry, especially tobacco, has concentrated along the Southern Railroad line near US 421. ITT, Grinnell, and several other industrial firms have located on NC 66 northwest of town. Finally, trucking and warehousing firms have concentrated on NC 66 south of I-40. This region will become more attractive with the scheduled NC 66 widening and proposed East/West highway.

Approximately 5%, or over 400 acres, within the 8200 acre planning area, is zoned for commercial use. Almost 60% of that land is developed. Frequently, commercial development is desired in areas not appropriately zoned. The draft land use plan discusses the need for proper siting of new commercial development: (1) for ready access to major thoroughfares; (2) to encourage clusters rather than commercial strips; and (3) to provide adequate off-street loading, parking, and pedestrian movement.

Existing commercial development is concentrated in two areas: The NC 150/I-40 interchange and the Central Business District (CBD). The I-40/NC 66 interchange is a smaller node of traveler oriented commercial development. Potential exists for intense commercial development on NC 66 south if the proposed freeway is constructed. Otherwise, future commercial development will likely be expansions of existing nodes or relatively small neighborhood oriented centers.

Residential development occupies most of the Kernersville Planning Area. Specific data on land actually developed is not available, but 75% (approximately 6300 acres) of the planning area is zoned for residential use. Most of Kernersville's residential development is single-family as evidenced by the fact that less than 4% of the residential land is zoned for multi-family. The draft land use plan anticipates continued single-family emphasis, although lot size may shrink and therefore densities increase slightly. Land on the west and north appears especially attractive to high density residential development. However, this could change, as sewer becomes available on the southwest. The existence of both sewer and good roads may encourage extensive development in the corridor between Kernersville and Winston-Salem.

IV. EXISTING AND FUTURE TRANSPORTATION PROBLEMS

Existing System

The planning reports prepared in 1971-1972 included a Thoroughfare Plan. Unfortunately that plan was never accepted by the NCDOT and therefore never mutually adopted. However, the analysis and thought remain valid and serve as a good place to begin.

I-40 serves as a good bypass route and partially helps to distribute trips in the Kernersville area (internal-internal trips) but limitation on interchanges restricts many of these trips. The interstate combines with I-85 to create major east-west highway in North Carolina. From Kernersville's perspective, I-40 provides excellent access to Greensboro and Winston-Salem. Within the planning area there are two full interchanges, NC 66 and NC 150, and a partial interchange at US 421.

Kernersville has good access to the south via NC 66, and thereby US 311 to High Point and I-85. Travel to the northeast and northwest is provided by NC 150 and NC 66 respectively. North Carolina 150 is an important route to US 220 and into central Virginia. Many people drive northwest on NC 66 to reach US 52 and continue north into the more western sections of Virginia.

Kernersville's downtown street pattern is typical of many towns with a converging of radial streets in the central business district. Most of the radial routes provide good access to the downtown. Circumferential loop routes are not present to provide access around the downtown.

Major radial routes directly serving the CBD in Kernersville are NC 66, Dobson Street, Piney Grove Road, NC 150, East Mountain Street and Union Cross Road.

The existing east-west crosstown streets in Kernsville are West Mountain Street-East Mountain Street and Hopkins Road-Old Winston Road-Pineview Roads. Hopkins Road and Old Winston Road serves the western part of the planning area. It connects with NC 150 north of I-40 and provides the only access to I-40 between Kernersville and Winston-Salem, a distance of approximately 4 miles.

The Town of Kernersville maintains a total of approximately 26 miles of streets within their jurisdiction. This is in addition to streets and highways in the state maintenance system which accounts for approximately 14 miles. Within the city limits of Kernersville all state maintained streets are paved. The existing system is shown in Figure 2.

Capacity Deficiency Analysis

A relatively good indication of the adequacy of the existing street system is a comparison of traffic volumes with the ability of the streets to move traffic. In an urban area, a street's ability to move traffic is generally controlled by the spacing of major intersections, the width of the pavement, and the traffic control devices utilized. Thus, the ability of a street to move traffic can be increased to some degree by restricting parking and turning movements, using proper sign and signal devices, and by the application of other traffic engineering techniques.

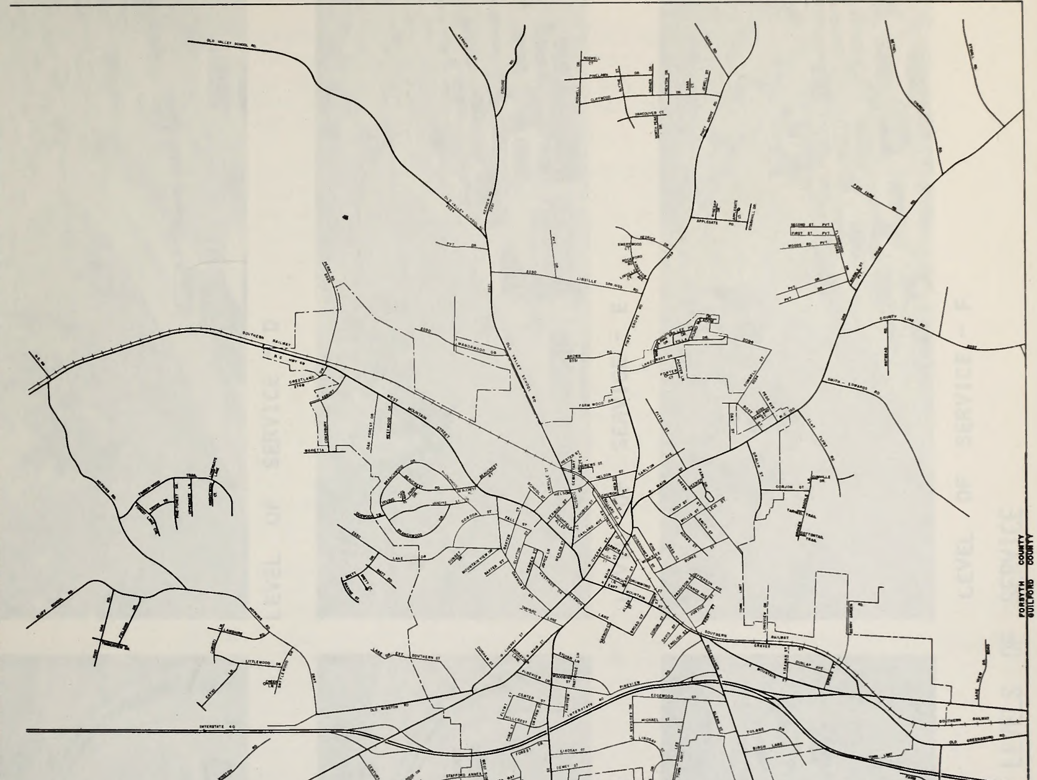
Capacity is defined as the maximum number of vehicles which has a reasonable expectation of passing over a given section of a roadway in one direction, or in both directions, during a given time period under prevailing roadway and traffic conditions.[1] The relationship of traffic volumes to the capacity of the roadway will determine the level of service being provided. Six levels of service (Figure 3) have been selected to identify the conditions existing under various speed and volume conditions on any highway or street. The six levels of service[2] are:

(1) Level of Service A - A condition of free flow with low traffic volumes and high speeds. Traffic density is low, with speeds controlled by driver desires, speed limits, and physical roadway conditions. There is little or no restriction in maneuverability due to the presence of other vehicles, and drivers can maintain their desired speeds with Little or no delay.

(2) Level of Service B - A zone of stable flow, with operating speeds beginning to be restricted somewhat by traffic conditions. Drivers still have reasonable freedom to select their speed and lane operation. Reductions in speed are not unreasonable, with a low probability of traffic flow being restricted.

(3) Level of Service C - A zone of stable flow, but speeds and maneuverability are more closely controlled by higher volumes. Most of the drivers are restricted in their freedom to select their own speed, change lanes, or pass. A relatively satisfactory operating speed is still obtained with service volumes perhaps suitable for urban design practice.

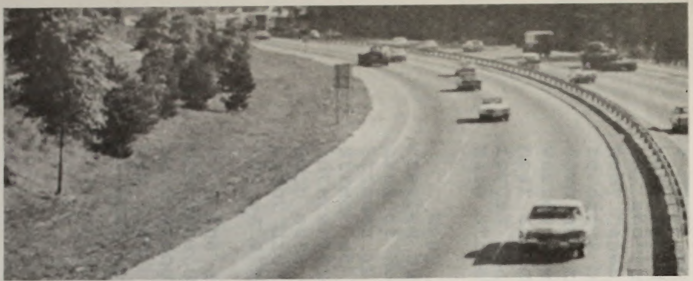
(4) Level of Service D - Approaches unstable flow, with tolerable operating speeds being maintained through considerable affected by changes in operating conditions. Fluctuations in volume and temporary



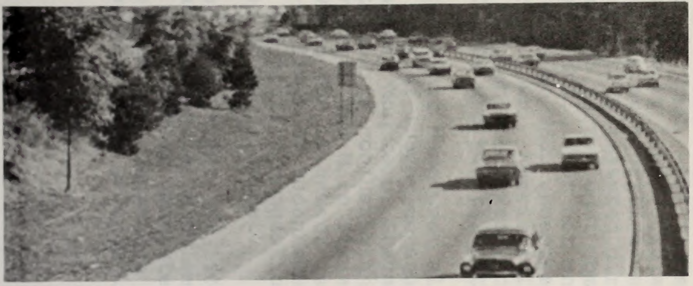
TOWN OF KERNERSVILLE
FORSYTH COUNTY, N.C.

CITY-COUNTY PLANNING BOARD
WINSTON-SALEM AND FORSYTH COUNTY

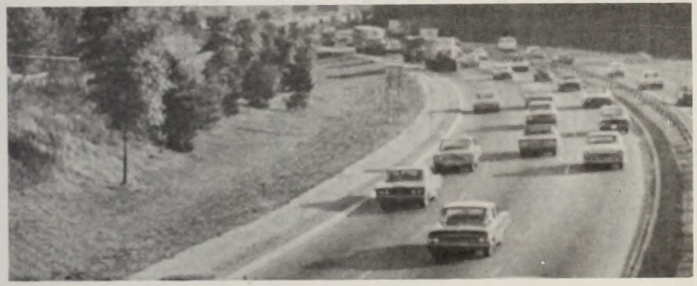
FIGURE 2



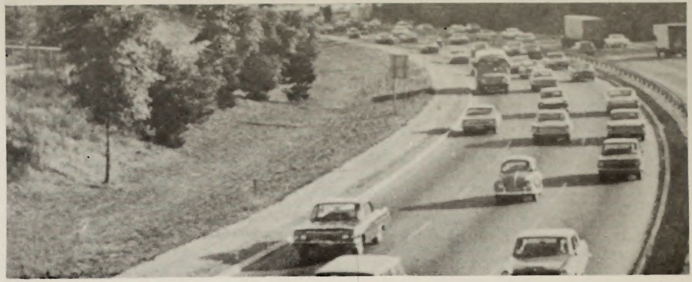
LEVEL OF SERVICE - A



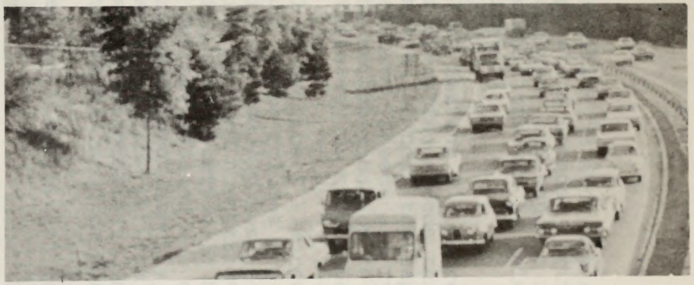
LEVEL OF SERVICE - B



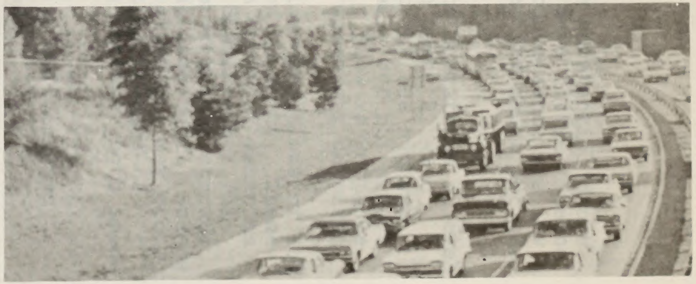
LEVEL OF SERVICE - C



LEVEL OF SERVICE - D



LEVEL OF SERVICE - E



LEVEL OF SERVICE - F

LEVELS OF SERVICE

FIGURE 3

restrictions to flow may cause substantial drops in operating speeds. Drivers have little freedom to maneuver, and confort and convenience are low, but conditions can be tolerated for short periods of time.

(5) Level of Service E - Represents operations at even lower operating speeds than in Level D, with volumes at or near the capacity of the highway. At capacity, speeds are typically but not always in the neighborhood of 30 mph. Flow is unstable, and there may be stoppages of momentary duration.

(6) Level of Service F - Forced flow operations of low speeds, where volumes are below capacity. These conditions usually result from lines of vehicles backing up from a restriction downstream. The section under study will be serving as a storage area during parts or all of the peak hour. Speeds are reduced substantially and stoppages may occur for short or long periods of time because of downstream congestion. In the extreme, both speed and volume can drop to zero.

System Deficiencies and Capacity Deficiencies

Within the planning area the road pattern is typical of a small cross-roads town. All roads are basically radial with few connections or loops. This was identified in 1970 as, and remains, the most critical system deficiency. In many cases a short trip measured directly takes much longer to drive because the person must come into the center of town and then back out. That not only is inefficient and wastes energy, it also adds unnecessary traffic on roads near the center of town. Specifically, the lack of loops forces traffic through the already congested intersection of Main Street (NC 150) and Mountain Street (NC 66).

Many intersections have poor alignment and the traffic created by the lack of loops increase the problems. The area of Bodenhammer, Mountain, Graves, Trent, and Pineview Streets is particularly confusing and needs redesign. Main Street at Piney Grove and Main Street at Salisbury Street are intersections where the alignment is the primary problem. Both sets of I-40 ramps at Bodenhamer Street (NC 66) have sight distance and traffic congestion problems compounded by the existence of Edgewood Street.

The area of Main Street (NC 150), Cherry Street, and Old Winston Road has special problems. Increasing development along Old Winston Road generates traffic desiring to use I-40. Consequently, congestion has become more severe at that intersection. The problem is particularly acute in the afternoon when heavy left turn movements completely block northbound Main Street.

Also typical of small towns is narrow right-of-way with development very close to the curb. Main Street for example could not be widened without substantial damage to abutting property, probably including the purchase of many structures. Several structures are historically or architecturally interesting and create a very pleasant residential atmosphere. Since only segments of NC 66 (East Mountain Street) south of NC 150 is multi-lane, these narrow streets severely limit potential traffic capacity. Even if a separate left turn phase is provided at a traffic signal, trucks may still be unable to make the turn.

Railroad crossing can create problems in any area. The railroad line through Kernersville is frequently used. The number of crossings are limited and all are at-grade. Dobson Street for example, is the only crossing from the north and will consequently carry virtually all the traffic from any new development.

A list of the above deficiencies provides some insight into the problem in Kernersville.

(1) Absence of good loop facilities

(2) Poor alignment of intersections

(3) Increasing development along radial or crosstown routes

(4) Narrow right of way

(5) Railroad crossings

(6) Absence of good bypass facilities (not mentioned above but a system deficiency)

Figure 4 illustrates traffic volume patterns on major Kernersville Streets. Figure 5 lists specific volumes at many points on the existing system.

Traffic Accidents

Traffic accident records are of assistance in defining problem areas and often pinpoint a deficiency or causal element, such as poor design, inadequate signing, ineffective parking, or poor sight distance. Accident patterns developed from analysis of accident data often lead directly to remedial action which produces a noticeable reduction in the number of accidents.

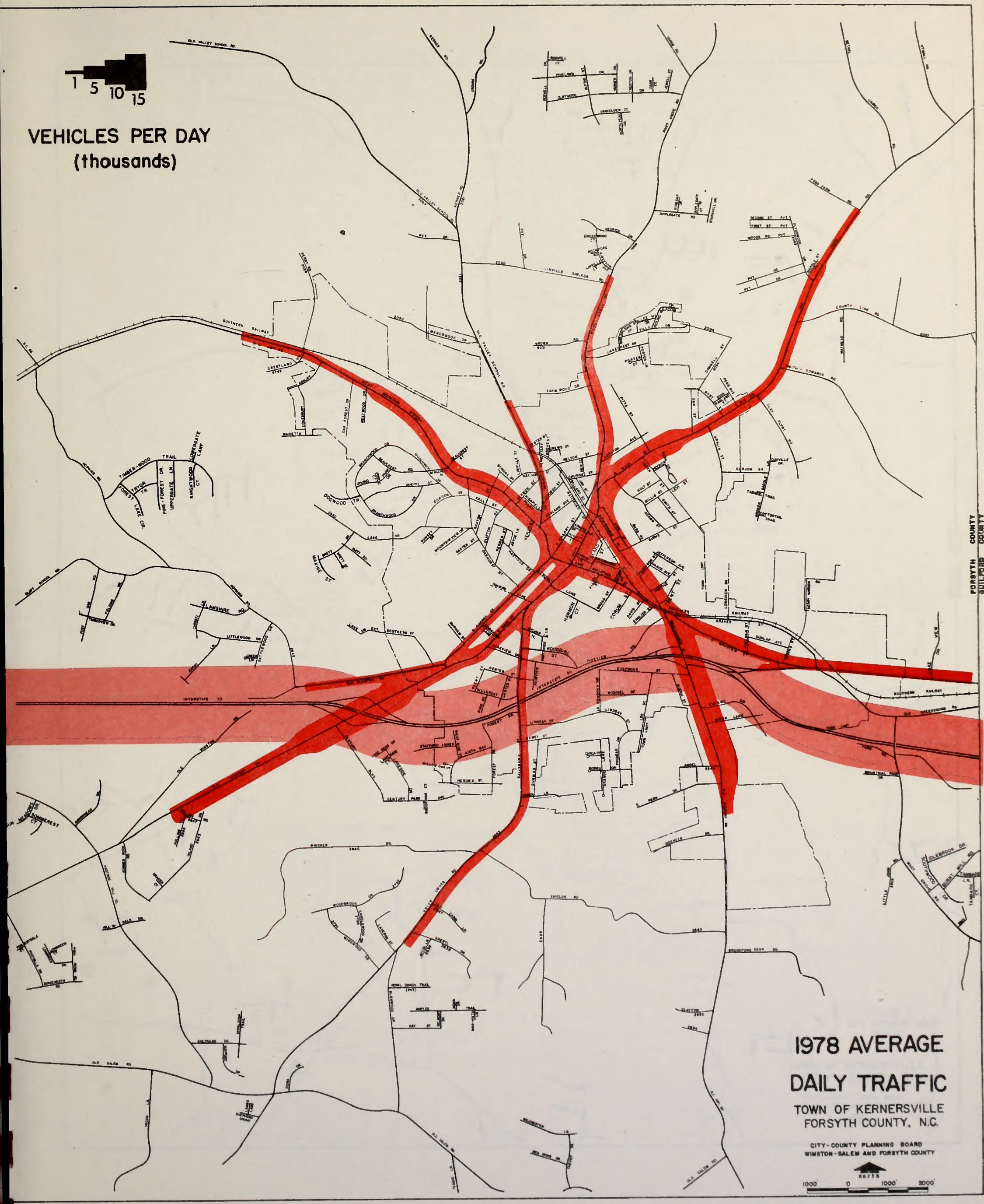

1
5
10
15
VEHICLES PER DAY
(thousands)
FORSYTH COUNTY
GUILFORD COUNTY
INTERSTATE 40
SOUTHERN RAILWAY
1978 AVERAGE
DAILY TRAFFIC
TOWN OF KERNERSVILLE
FORSYTH COUNTY, N.C.
CITY-COUNTY PLANNING BOARD
WINSTON-SALEM AND FORSYTH COUNTY
north
1000
0
1000
2000

FIGURE 4

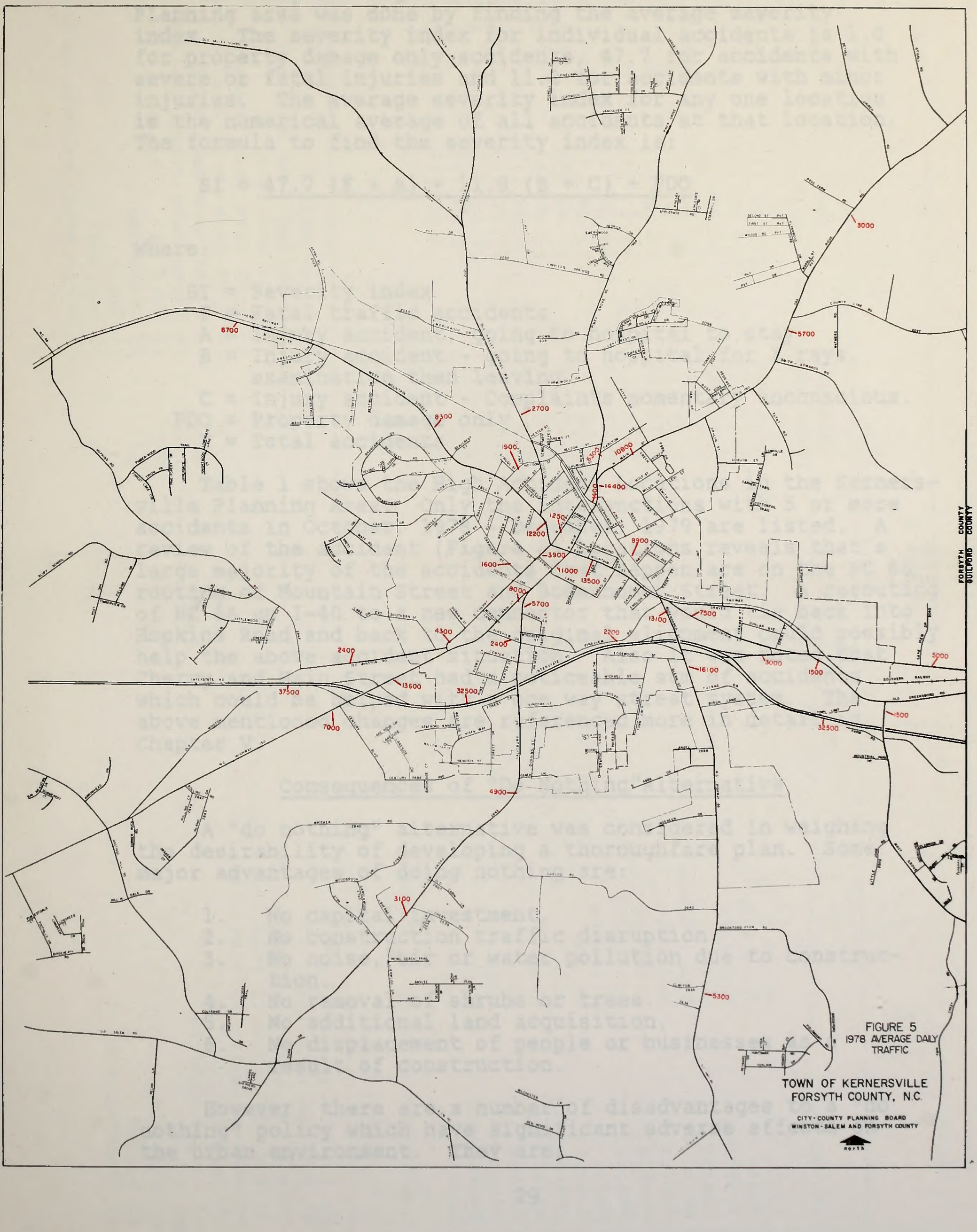


FIGURE 5
1978 AVERAGE DAILY TRAFFIC

TOWN OF KERNERSVILLE
FORSYTH COUNTY, N.C.

CITY-COUNTY PLANNING BOARD
WINSTON-SALEM AND FORSYTH COUNTY

Locating the high accident locations in the Kernersville Planning area was done by finding the average severity index. The severity index for individual accidents is 1.0 for property damage only accidents, 47.7 for accidents with severe or fatal injuries and 11.8 for accidents with minor injuries. The average severity index for any one location is the numerical average of all accidents at that location. The formula to find the severity index is:

$$SI = \frac{47.7\ (F + A) + 11.8\ (B + C) + PDO}{T}$$

Where:

SI = Severity index
F = Fatal traffic accidents
A = Injury accident, going to hospital to stay
B = Injury accident - going to hospital for X rays, examination then leaving
C = Injury accident - Complaints momentary unconscious.
PDO = Property damage only
T = Total accidents

Table 1 shows the High Accident Locations in the Kernersville Planning Area. Only the intersections with 5 or more accidents in October, 1978 - December, 1979 are listed. A review of the accident (Figure 6) locations reveals that a large majority of the accidents that happen are on the NC 66 routing of Mountain Street and Bodenhomer Street. A rerouting of NC 66 up I-40 to a new connector that would tie back into Hopkins Road and back to the original alignment could possibly help the above accident situation. Also it was noted that Cherry and Main Street had a noticeable sum of accidents which could be helped with a one way street system. The above mentioned changes are referenced more in detail in Chapter V.

Consequences of "Do Nothing" Alternative

A "do nothing" alternative was considered in weighing the desirability of developing a thoroughfare plan. Some major advantages of doing nothing are:

1. No capital investment.
2. No construction traffic disruption.
3. No noise, air or water pollution due to construction.
4. No removal of shrubs or trees.
5. No additional land acquisition.
6. No displacement of people or businesses as a result of construction.

However, there are a number of disadvantages to a "do nothing" policy which have significant adverse effects on the urban environment. They are:

TABLE 1

High Accident Location

Street Name	Reference Point	Total Accidents Oct. 1978 - Dec. 1979	Severity Index (Rank)	EPD[1] (Rank)	Major Type[2] Accident (No.)
I-40	NC 66	27	5.13 (6)	138.50 (1)	13 & 16 (5)
Main	Mountain	20	5.50 (5)	109.90 (2)	13 (5)
Bodenhamer	Mountain	12	2.80 (10)	33.60 (7)	21 (5)
Cherry	Main	11	1.98 (12)	21.80 (10)	15 & 16 (3)
Main	Piney Grove	10	2.08 (11)	20.80 (11)	21 (3)
Cherry	Mountain	8	3.70 (8)	29.60 (8)	13 (3)
Mountain	Oakhurst	7	9.21 (2)	64.50 (3)	13 (4)
Main	Salisbury	7	7.17 (4)	50.20 (5)	1 (5)
Main	Pineview	6	10.58 (1)	63.50 (4)	16 (3)
I-40	US 421	6	4.60 (7)	27.60 (9)	2 & 20 (2)
Bodenhamer	Main	6	4.60 (7)	27.60 (9)	15 & 17 (2)
Adam	Main	6	1.0 (13)	6.00 (13)	21 (3)
Harmon	Main	5	7.48 (3)	37.40 (6)	13 & 21 (2)
King	Main	5	3.16 (9)	15.80 (12)	1 & 13 (2)
Bodenhamer	Burke	5	1.00 (13)	5.00 (14)	16 & 21 (2)
Hugh	Main	5	1.00 (13)	5.00 (14)	15 & 22 (2)

[1] Equivalent Property Damage

[2] Type Accidents

01 Ran off road-right
02 Ran off road-left
03 Ran off road-straight ahead
04 Non-collision in road-overturned
05 Non-collision in road-other in road
06 Pedestrian
07 Parked vehicle
08 Train
09 Bicycle
10 Animal
11 Fixed object
12 Other object
13 Rear end-stop or slow
14 Rear end-turn
15 Left turn-same roadway
16 Left turn-cross traffic
17 Right turn-same roadway
18 Right turn-cross traffic
19 Head on
20 Sideswipe
21 Angle
22 Backing
23 Other motor vehicle in traffic

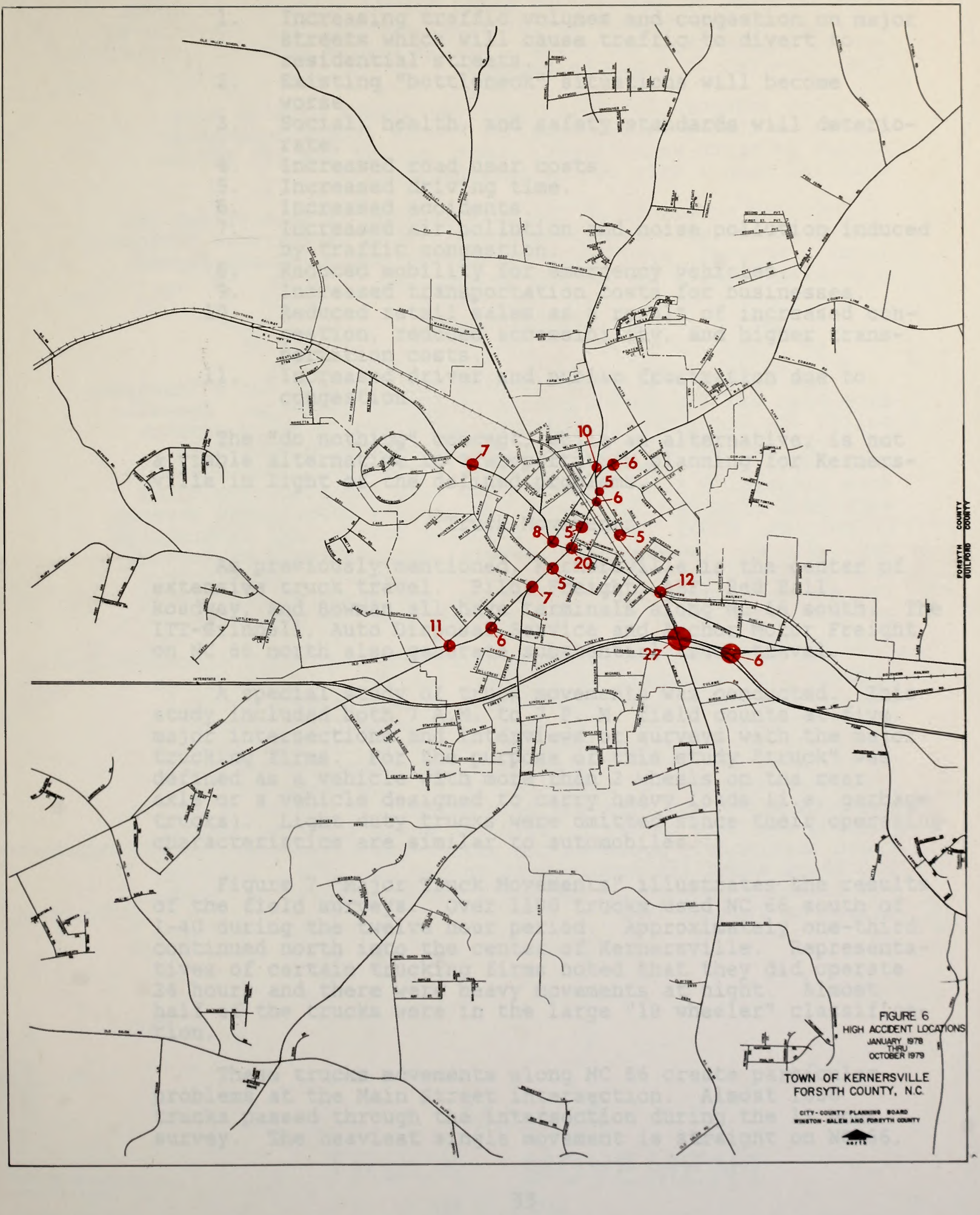


FIGURE 6
HIGH ACCIDENT LOCATIONS
JANUARY 1978
THRU
OCTOBER 1979

TOWN OF KERNERSVILLE
FORSYTH COUNTY, N.C.

CITY-COUNTY PLANNING BOARD
WINSTON-SALEM AND FORSYTH COUNTY

1. Increasing traffic volumes and congestion on major streets which will cause traffic to divert to residential streets.
2. Existing "bottleneck" situations will become worse.
3. Social, health, and safety standards will deteriorate.
4. Increased road user costs.
5. Increased driving time.
6. Increased accidents.
7. Increased air pollution and noise pollution induced by traffic congestion.
8. Reduced mobility for emergency vehicles.
9. Increased transportation costs for businesses.
10. Reduced retail sales as a result of increased congestion, reduced accessibility, and higher transportation costs.
11. Increased driver and public frustration due to congestion.

The "do nothing" concept, while an alternative, is not a viable alternative in transportation planning for Kernersville in light of the defined problems.

Truck Movements

As previously mentioned, Kernersville is the center of extensive truck travel. Pilot Freight, ABF, Red Ball, Roadway, and Bowman all have terminals along NC 66 south. The ITT-Grinnell, Auto Disposal Service and Anchor Motor Freight on NC 66 north also generate substantial truck travel.

A special study of truck movements was conducted. This study included both 7 A.M. to 7 P. M. field counts at five major intersections and interviews or surveys with the major trucking firms. For the purpose of this study "truck" was defined as a vehicle with more than 2 wheels on the rear axle or a vehicle designed to carry heavy loads (i.e. garbage trucks). Light duty trucks were omitted since their operating characteristics are similar to automobiles.

Figure 7 "Major Truck Movements" illustrates the results of the field surveys. Over 1100 trucks used NC 66 south of I-40 during the twelve hour period. Approximately one-third continued north into the center of Kernersville. Representatives of certain trucking firms noted that they did operate 24 hours and there were heavy movements at night. Almost half of the trucks were in the large "18 wheeler" classification.

These trucks movements along NC 66 create particular problems at the Main Street intersection. Almost 1000 trucks passed through the intersection during the 12 hour survey. The heaviest single movement is straight on NC 66, with straight on Main Street being second highest. Although only 29% of the trucks turn at this intersection, the streets are so narrow that the turning trucks create problems greater than expected from simple numbers.

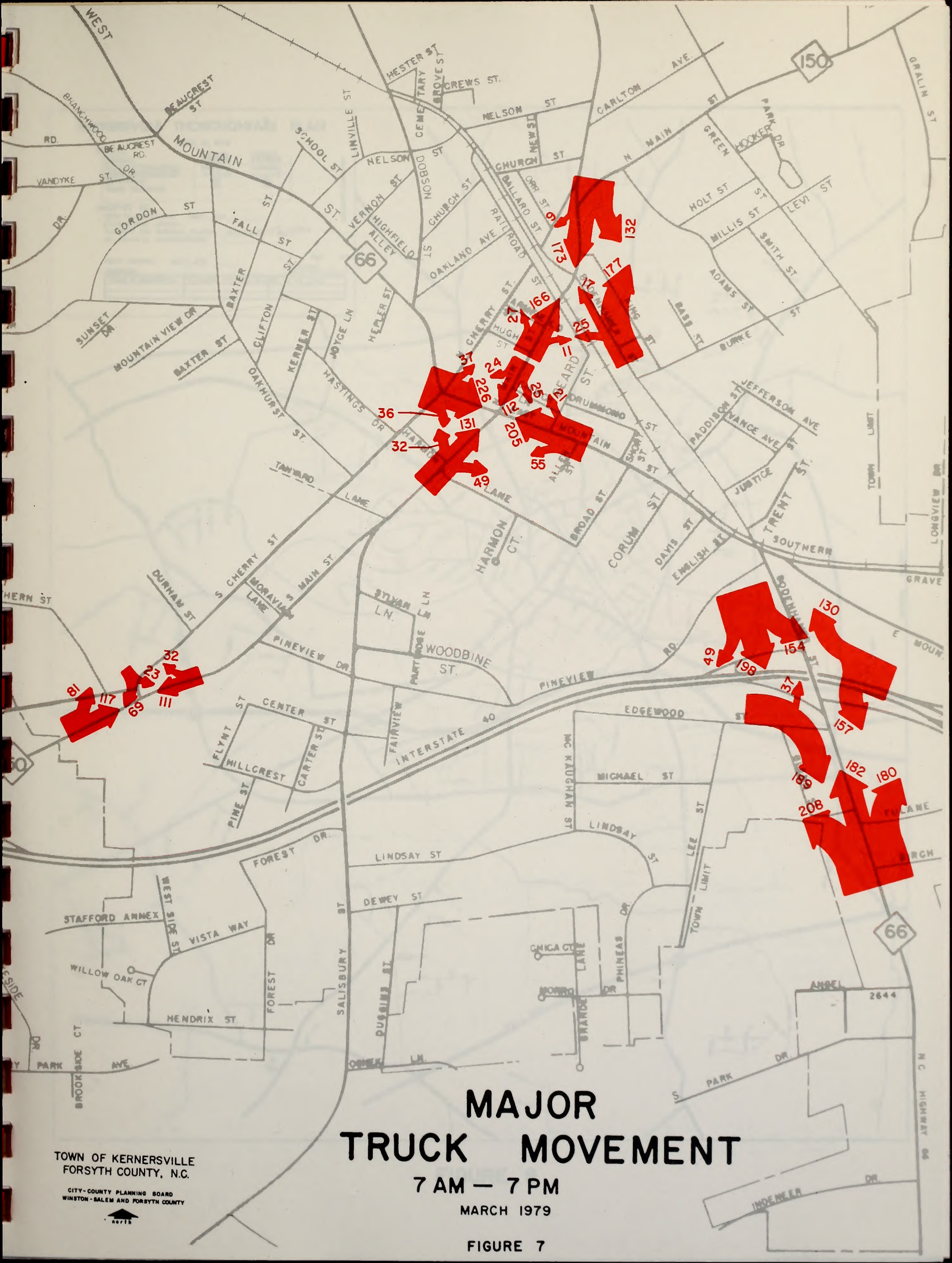
One reasons that relatively few trucks turn at Main Street is that a large number of trucks follow Bodenhamer Street to North Main Street. Over half of the 637 trucks observed made a turn at the intersection.

Trucks movements at the intersection of Main Street and Cherry Street were relatively light, with many trucks obviously local. However, even these relatively small volumes become a problem because of the bad geometrics.

Public Input

The scheduling of the studies and proposal for a Thoroughfare Plan was the direct result of public requests. Specifically, the Kernersville Aldermen and Planning Board members believed that an adopted plan was essential to encourage construction of essential projects. The Town hired Russell-Axon consulting firm to update the land use plan, including work on a highway plan. Work was closely coordinated between consultant, NCDOT, Town, and Planning Board staff to minimize duplication. Consequently, several meetings held by Russell-Axon provided important input to this report. Throughout the process, the Twin City Sentinel and Kernersville News provided continuing newspaper coverage of the proposals.

The Kernersville Planning Board and Town Board discussed highway plan alternatives at their February, 1979 meetings. During that same time, discussions were held with several major trucking firms. The Winston-Salem/Forsyth County Technical Coordinating Committee approved the plan (Figure 8) on March 29, 1979, followed by Transportation Advisory Committee approval on April 18, 1979. The Kernersville Planning Board approved the plan on April 9, 1979. A public hearing was held on May 1, 1979, at which time the Town Board unanimously approved the plan. The City-County Planning Board added its endorsement on May 10, 1979. The Plan was mutually adopted by the North Carolina Board of Transportation on June 8, 1979.



MAJOR TRUCK MOVEMENT

7 AM — 7 PM

MARCH 1979

FIGURE 7

TOWN OF KERNERSVILLE
FORSYTH COUNTY, N.C.

CITY-COUNTY PLANNING BOARD
WINSTON-SALEM AND FORSYTH COUNTY

north

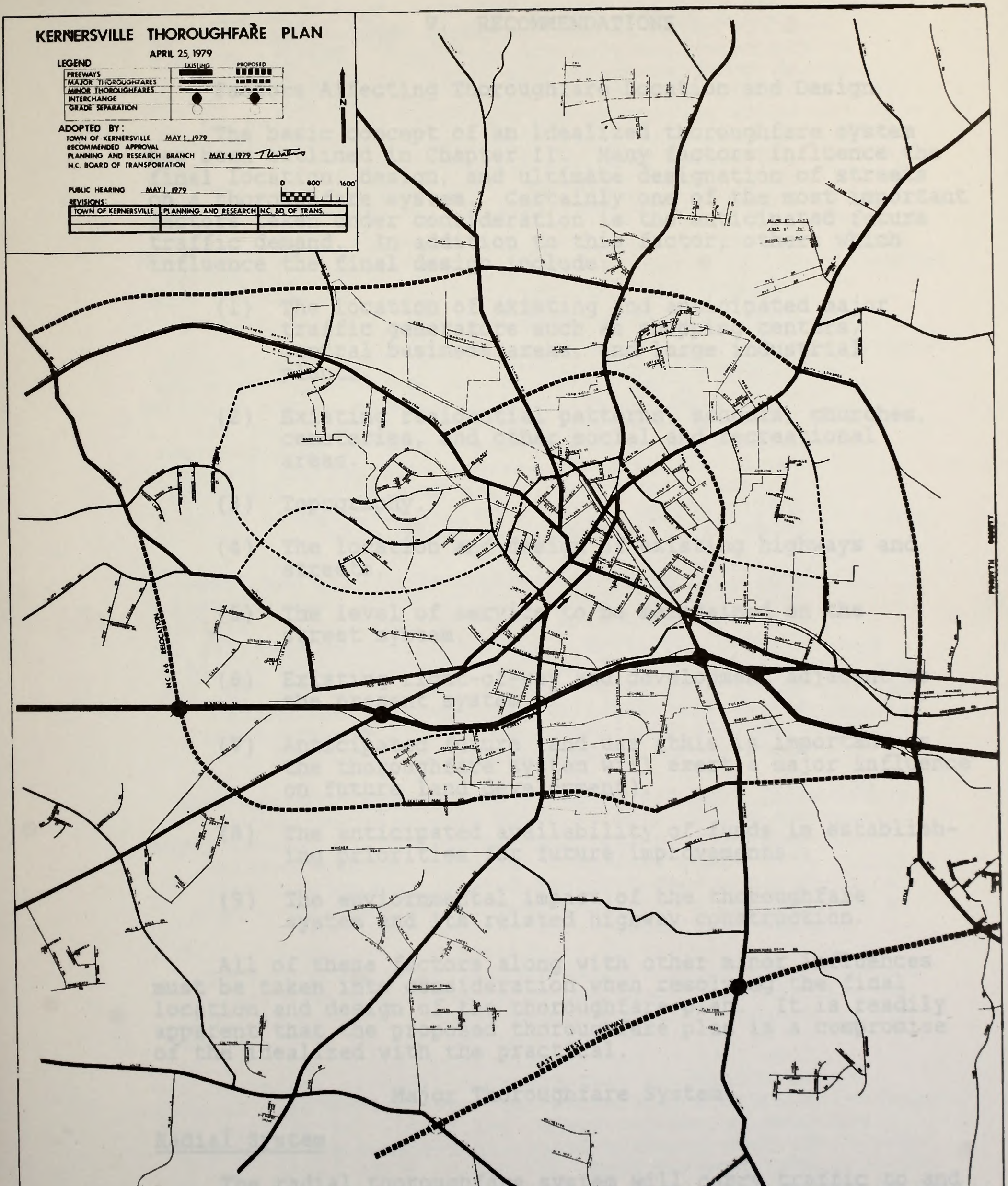

KERNERSVILLE THOROUGHFARE PLAN
APRIL 25, 1979
LEGEND
EXISTING
PROPOSED
FREEWAYS
MAJOR THOROUGHFARES
MINOR THOROUGHFARES
INTERCHANGE
GRADE SEPARATION
N
ADOPTED BY:
TOWN OF KERNERSVILLE MAY 1, 1979
RECOMMENDED APPROVAL
PLANNING AND RESEARCH BRANCH MAY 4, 1979
N.C. BOARD OF TRANSPORTATION
0 800' 1600'
PUBLIC HEARING MAY 1, 1979
REVISIONS:
TOWN OF KERNERSVILLE
PLANNING AND RESEARCH
N.C. BD. OF TRANS.
INTERSTATE 40
NC 66 RELOCATION
EAST-WEST FREEWAY
FORSYTH COUNTY

FIGURE 8

V. RECOMMENDATIONS

Factors Affecting Thoroughfare Location and Design

The basic concept of an idealized thoroughfare system has been outlined in Chapter II. Many factors influence the final location, design, and ultimate designation of streets on a thoroughfare system. Certainly one of the most important factors taken under consideration is the anticipated future traffic demand. In addition to this factor, others which influence the final design include:

(1) The location of existing and anticipated major traffic generators such as shopping centers, central business areas, and large industrial plants.

(2) Existing residential patterns, schools, churches, cemeteries, and other social and recreational areas.

(3) Topography.

(4) The location and design of existing highways and streets.

(5) The level of service to be maintained on the street system.

(6) Existing right-of-way and development adjacent to the present system.

(7) Anticipated future land use (this is important as the thoroughfare system will exert a major influence on future land development).

(8) The anticipated availability of funds in establishing priorities for future improvements.

(9) The enviornmental impact of the thoroughfare system and its related highway construction.

All of these factors along with other minor influences must be taken into consideration when resolving the final location and design of the thoroughfare plan. It is readily apparent that the proposed thoroughfare plan is a compromise of the idealized with the practical.

Major Thoroughfare System

Radial System

The radial thoroughfare system will carry traffic to and from the central area. The following streets comprise the radial system.

(1) West Mountain Street (NC 66) - West Mountain Street from SR 2413 to South Cherry Street serves Kernersville from the northwest. Traffic volumes on the road range from 6,000 vehicles per day to 12,000 vehicles per day in the base year. Due to NC 66 Relocation and the Outer Loop (Linville Springs Road Ext.) this road should be adequate in the future from the Planning Area limits to the Inner Loop. From the Inner Loop to South Cherry Street a four lane facility is recommended.

(2) Old Valley School Road Old Valley School Road from Belews Creek to West Mountain Street also serves Kernersville from the Northwest. Volumes on this road range from 2,500 to 4,000 vehicles per day.

(3) Piney Grove Road - Piney Grove Road from SR 2019 to North Main Street serves Kernersville from the north with current traffic volumes in the 5,000 to 7,000 vehicles per day range. A connector is proposed to connect Adams Street to Nelson Street which will help the present intersection problem of Piney Grove Road, North Main Street and North Cherry Street. The connector is proposed to be 2 lanes with urban parking on one side.

(4) Oak Ridge Road (Main Street-NC 150) - Oak Ridge Road from the county line to North Cherry Street serves Kernersville from the north east. Traffic volume range from 3,000 to 11,000 vehicles per day in the base year (1978). The Inner Loop should divert some trips on Main Street, in the CBD, but a four lane facility is proposed from Cherry Street to the Inner Loop to help traffic flow close to the center of town.

(5) East Mountain Street - East Mountain Street from the county line to North Cherry Street serves Kernersville from the east. Traffic volumes range from 5,000 to 14,000 vehicles per day on this route. East Mountain Street from North Cherry Street to the Inner Loop is recommended to be a four lane section.

(6) NC 66 South - NC 66 south from SR 2611 to East Mountain Street serves Kernersville from the south. Traffic volumes on this road range from 5,500 to 16,000 vehicles per day in 1978. NC 66 from I-40 to Bunker Hill/Sandy Bridge Road is to be widened to four and five lanes as stated in the NCDOT Transportation Improvement Program. Construction is set for fiscal year 1983. NC 66 from I-40 to East Mountain Street is recommended to be a four lane section.

(7) Union Cross Road - Salisbury Street - These two routes continue to serve Kernersville from the southwest from SR 2669 to South Cherry Street. Traffic volumes in 1978 range from 3,000 to 6,000 vehicles per day. A new connector from South Main Street to South Cherry Street will extend Salisbury Street to align up with Oakhurst Street. This new connector will serve to help circulate traffic in the one way pair of Cherry Street and Main Street. This new connector will also help traffic desiring to go north west up Oak Street to Mountain Street. The recommended cross section for this new connector is two lanes with urban parking on both sides.

(8) NC 150 South - NC 150 South from SR 2659 to South Cherry Street serves Kernersville from the southwest with 1978 traffic volumes of 7,000 to 14,000 vehicles per day. NC 150 from NC 66 Relocation to South Cherry Street is recommended to be a five lane section.

Crosstown Streets

The Crosstown System is designed to carry traffic along the fringe of the central business district, and ideally, without the necessity of having crosstown traffic pass through the CBD. The crosstown system recommended is as follows:

(1) Mountain Street - This street carries east-west traffic through the CBD. The disadvantage of this street is that it does go through the CBD and not around it. Widening to a four lane is recommended from the Inner Loop Road westward to the northern connection of the Inner Loop.

(2) Cherry Street - Main Street - These two facilities serve to provide north-south crosstown movements. The use of these two streets as a one way pair will help traffic flow on Main Street. By reducing the traffic flow on Main Street, Cherry Street's traffic will increase slightly. (See Appendix B). A new cross section will connect South Cherry Street with a section of North Cherry Street so that these two streets will work as a one way pair with Main Street. The cross section for this new connector should be two lanes with parking on one side.

(3) I-40 - With the construction of the East-West Freeway south of Kernersville the existing roadway (I-40) will be used more for internal-internal trips and external-internal trips with the through trips going to the East West Freeway. The proposed Interchange at I-40 and NC 66 relocation will help distribute crosstown trips more efficiently.

Loop System

The Loop System is intended to carry traffic between outlying areas and provide for lateral movements between radials.

(1) Outer Loop - This proposed facility consists of a portion of Hopkins Road, Hopkins Road Extension, Century Park Avenue, South Park Extension, South Park Drive, Industrial Park Extension, Industrial Park, a portion of Macy Grove Road, Macy Grove Road Extension, Smith Edwards Road, Smith Edwards Road Extension, Linville Springs Road, Linville Springs Road Extension, NC 66 and NC 66 Extension. The Outer Loop will provide good access to exterior regions in the Kernersville area. Part of the Outer Loop consists of NC 66 Relocation down Hopkin Rd. to Hopkins Road Extension to an interchange with I-40 then back to NC 66 south using I-40. This new routing will save valuable time lost going through town and trucks wanting to go north on NC 66 will not have to go into Kernersville and can bypass the town.

The Outer Loop System mentioned above will help relieve over capacity radials and the movement of trips between outer regions of the planning area. The Outer Loop roads cross section is recommended to be 2 lanes curb and gutter, except for Hopkins Road Extension (From I-40 to Century Park Avenue) and South Park Drive Extension (From Union Cross Road to Century Park Avenue) which is recommended to be 2 lanes with parking on both sides. Sufficient right-of-way should be obtained for the Hopkins Road portion of the loop to provide for a four lane facility as future situations dictate. Also an interchange at Macy Grove Road and the present I-40 should be considered if the routing of I-40 is changed to the East-West Freeway. This interchange could help disperse traffic on the east side of Kernersville and give better access to the planning area.

(2) Partial Inner Loop - A new road from NC 66 south to West Mountain Street will help decrease traffic in the CBD (Central Business District). The distribution of traffic in the downtown area can be helped with this loop. The one way pair of Cherry Street and Main Street will benefit the downtown, with better distribution of traffic just as much as the partial Inner Loop. The recommended cross section for the Partial Inner Loop is 4 lanes. Particular attention must be given to the southern terminus of the loop with Bodenhamer Street, Mountain Street and NC 66 South.

Bypass System

The Bypass System in the planning area consists of the East West Freeway and NC 66. The recommended East-West Freeway is an extension of Corporation Freeway in Winston-Salem and connects back to I-40 east of Kernersville in Guilford County. This new freeway will be a short cut for through trips and will help relieve existing I-40. This is very beneficial for Kernersville because the new freeway will allow for expansion south of present I-40. The new freeway along with existing I-40 will provide a truly unique transportation service dimension.

The second bypass, NC 66, has already been mentioned. This rerouting starts an existing NC 66 north and preceeds down Hopkins Road to a new road (Hopkins Road-Extension) that has a interchange with I-40 and from here traffic proceeds down I-40 to interchange with NC 66 South and out of the Town. This rerouting will help truck traffic and auto traffic in relieving the downtown area of traffic congestion.

Other Major Thoroughfares not in above Classifications

(1) Old Salem Road

(2) Macy Grove Road

(3) Hopkins Road-Old Winston Road

Minor Thoroughfares

Minor thoroughfares proposed for inclusion in the thoroughfare plan include streets which carry a collector distribution function and perform a greater land service function than do the major thoroughfares. Minor thoroughfares include:

Radials

(1) Lake Drive-Lake Drive Extension - This radial on the west of Kernersville will help the flow of traffic from the Hopkins Road area or traffic in the surrounding subdivisions, as a cut off road into the CBD area of the town. This road is recommended to be two lanes with parking on both sides.

(2) Timber-Wood Trail and Timber-Wood Trail Extension - This radial serves the same general area as the radial mentioned in (1) and a two lane with parking on both sides is recommended for this road.

(3) Old Greensboro Road

Crosstown Streets

(1) Bodenhamer Street - This street serves Kernersville through the center of the CBD from NC 66 South to Old Valley School Road.

(2) Pineview Drive - Pineview Drive with a western extension to connect South Main Street and South Cherry Street and with a eastern extension to connect up with the Partial Inner Loop (Major Thoroughfares) at NC 66 south helps serve Kernersville to the south of the CBD. The two connectors have a recommended cross-section of two lanes with parking on one side.

Loop System

(1) Interior Loop - The Interior Loop will help to move traffic around the core area of Kernersville thereby decreasing the traffic in the CBD. Streets which compromise the Interior Loop are Oakhurst Street, Clifton Street, Clifton Street Extension, Nelson Street, Piney Grove Road Extension (Major Thoroughfare), Adams Street, Adams Street Extension. The Clifton Street Extension cross section is recommended to be two lanes with parking on both sides. Adams Street Extension cross section is recommended to be two lanes with parking on one side.

(2) Intermediate Loop - The Intermediate Loop consists of a connection from Berry Garden Road to Clay Flynt Road. The cross section for this connector is recommended to be two lanes.

Other Minor Thoroughfares

(1) Bethel Church Road

(2) Bluff School Road

(3) Century Boulevard

(4) County Line Road

(5) Crestland Drive-Crestland Drive Extension - Lower Gate Lane - This recommended road cross section is two lanes with parking on both sides.

(6) Forest Drive Forest Drive Extension - Two lanes cross section proposed with parking on both sides.

(7) Hasting Hill Road

(8) Kerner Road

(9) Perry Road

(10) Shields Road

(11) Vance Road

Design Requirements

Design requirements for thoroughfares vary according to the desired capacity (number of vehicles a street can accommodate) and level of service to be provided. Thus, universal standards in the design of thoroughfares are not practical; each street section must be individually analyzed.

The level of service is a function of the ease of movement experienced by motorists using the facility. The ability of a motorist to drive at a desired speed is dependent on the physical design of the street, the character of traffic on the street, and imposed speed restrictions. The level of service is generally indicated by the overall travel speed experienced by drivers. The overall travel speed is the total distance traveled divided by the total time required, including all delays.

Recommended minimum levels of service are generally as given in Table 2. The overall speeds given should be attainable when all components of the urban thoroughfare system are integrated into a network which conforms to the major travel desires of the street users. The level of service to be provided by a specific highway improvement should be compatible with both the desires of the drivers and the economic aspects of the proposed improvement.

TABLE 2

Desirable Levels of Service for Thoroughfares Within Urban Areas

	Overall Travel Speed During Peak Traffic Conditions		
Facility	Suburban Area	Intermediate Area	Central Business Area
Major Thoroughfares			
a) Full control of access	45-55 MPH	45 MPH	35 MPH
b) No control of access	25-35 MPH	20-30 MPH	10-20 MPH

Minor Thoroughfares — In accordance with local policies since these streets are normally the responsibility of the respective municipality.

There are many factors which influence the traffic capacity of a street. Some typical capacities for various street cross sections are related here for general guidance.

TABLE 3

Typical Capacity Design Standards

Facility	Practical Capacity	
	Vehicles Per Hour Per Lane	Vehicles Per Day
Two Lanes Plus Parking		
Two-way	400-500	5,700-8,200
One-way	450-600	10,000-13,000
Four Lanes, No Parking		
Two-way	450-550	13,000-18,500
Two-way with special measures	600-800	17,000-26,000

These typical capacities are based on average traffic flow characteristics with: (1) 10 percent of the 24-hour volume during the peak hour; (2) 60-70 percent peak hour traffic in the predominant direction; (3) 10 percent truck volumes; and (4) 50 percent green time at intersections.

Typical Cross Sections recommended for Kernersville thoroughfares are shown in Figure 9. Cross section "F" is typical for four lane divided highway in rural areas and for interstates. Cross section "C" and "D" are typical for major thoroughfares in developed areas. Cross section "A" and "B" are typical for minor thoroughfares. Cross section "E" would be normally recommended in rural areas or in staged construction. Cross sections recommended for the individual routes are given in Appendix A, Table 1.

Construction Priorities and Cost Estimates

The recommended improvements are separated into projects and projects grouped into priority increments of approximately five years each based on needs as determined from existing traffic knowledge of the area problems, land use, knowledge of models in other areas and engineering judgement. This

TYPICAL THOROUGHFARE CROSS SECTIONS

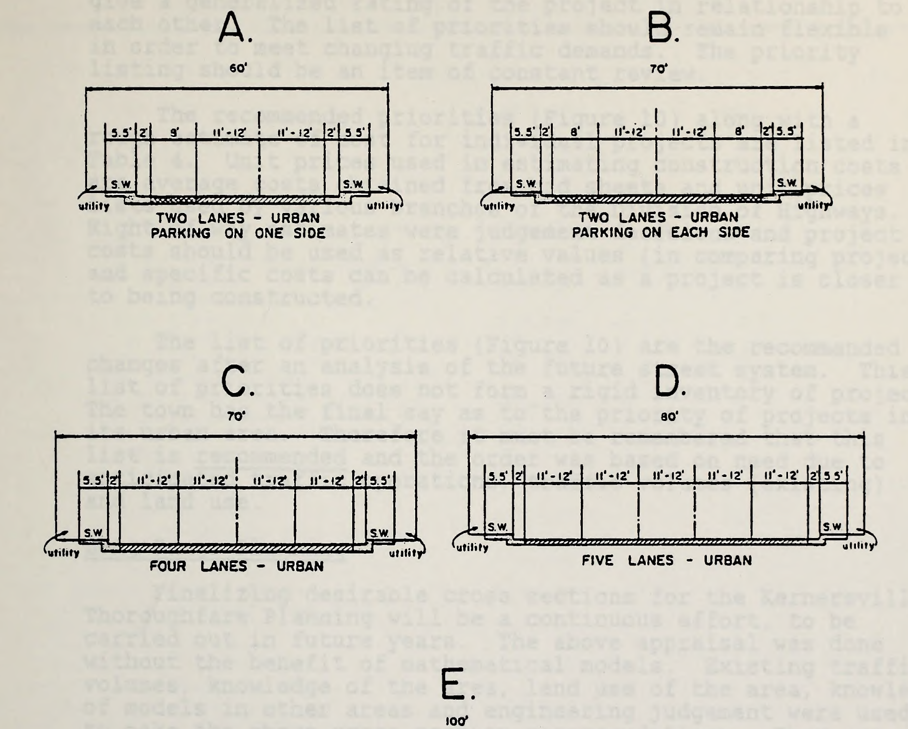


FIGURE 9

Minor Thoroughfares — In accordance with local policies since these streets are normally the responsibility of the respective municipality.

There are many factors which influence the capacity of a street. Some typical capacities for various street cross sections are presented here [illegible].

Typical Capacity Design Standards

Facility	Practical Capacity	
	Vehicles Per Hour Per Lane	Vehicles Per Day
Two Lanes Plus Parking		
Two-way	400-500	5,700-8,200
One-way	450-600	10,000-13,000
Four Lanes, No Parking		
Two-way	400-500	13,000-18,500
Two-way with control measures	600-800	17,000-26,500

These typical capacities are based on average traffic flow characteristics with: (1) 10 percent of the 24-hour volume during the peak hour; (2) 60-70 percent peak hour traffic in the predominant direction; (3) 10 percent truck volumes; and (4) 50 percent green time at intersections.

Typical cross sections recommended for Kernersville thoroughfares are shown in Figure 9. Cross section "F" is typical for four lane divided highway in rural areas and for interstates. Cross section "C" and "D" are typical for major thoroughfares in developed areas. Cross section "A" and "B" are typical for minor thoroughfares. Cross section "E" would be normally recommended in rural areas or as staged construction. Cross sections recommended for the individual routes are given in Appendix A, Table 1.

Construction Priorities and Cost Estimates

The recommended improvements are separated into projects and projects grouped into priority intervals of approximately five years each based on needs as determined from existing traffic knowledge of the area problems, land use, knowledge of models in other areas and engineering judgement. This does not necessarily mean that a certain project should be constructed at any specific time, only that groupings will give a generalized rating of the project in relationship to each other. The list of priorities should remain flexible in order to meet changing traffic demands. The priority listing should be an item of constant review.

The recommended priorities (Figure 10) along with a rough estimate of cost for individual projects are listed in Table 4. Unit prices used in estimating construction costs are average costs obtained from bid sheets and unit prices lists used by various branches of the Division of Highways. Right of way estimates were judgement decisions and project costs should be used as relative values (in comparing projects) and specific costs can be calculated as a project is closer to being constructed.

The list of priorities (Figure 10) are the recommended changes after an analysis of the future street system. This list of priorities does not form a rigid inventory of projects. The town has the final say as to the priority of projects in its urban area. Therefore it must be remembered that this list is recommended and the order was based on need due to anticipated traffic operations, traffic volumes (existing) and land use.

Long Range Planning

Finalizing desirable cross sections for the Kernersville Thoroughfare Planning will be a continuous effort, to be carried out in future years. The above appraisal was done without the benefit of mathematical models. Existing traffic volumes, knowledge of the area, land use of the area, knowledge of models in other areas and engineering judgement were used to make the above cross section recommendations. They are not hard and fast but as every project comes up for evaluation (EIS) each cross section in this report should be judged as a first estimate. A county wide study which will include all of Forsyth County and use models will give better judgement as to widening and future volumes on roadways. This report should provide guidance until this county study is completed.

A constant reappraisal effort should be maintained in regard to the thoroughfare plan. There may develop situations where the proirity of a certain project may need to be changed or the location of a certain route altered due to recent developments in the project vicinity.

Traffic Operations

Traffic operation is concerned with the efficient use of existing streets. Through the use of such techniques as one-way operations, coordination of traffic signals, provision

TABLE 4

CONSTRUCTION PRIORITIES AND COST ESTIMATES*

Facility and Section	Total Cost (Construction & ROW)	Recommended Cross Sections	Priority
NC 66 I-40-SR 2611	4,400,000	C&D	TIP
NC 150 (Main Street) I-40-Cherry Street	50,000	D	TIP
East-West Freeway US 311-I-40	28,000,000	F	1
NC 66 Relocation Hopkins Road - I-40 and NC 66-West Mountain Street (Interchange Included)	2,100,000	E	1
Cherry Street Extension Railroad Street-Bodenhamer Street	150,000	A	1
Piney Grove Road Extension Nelson Street-North Main Street	220,000	A	1
NC 150 (Kernersville Road) Hopkins Road Extension-I-40	300,000	D	1
West Pineview Drive Extension Main Street-Cherry Street	100,000	A	1
Salisbury Road Extension Main Street-Cherry Street	150,000	B	1
Hopkins Road Extension I-40-Century Park Avenue	1,000,000	B	2
South Park Drive Extension South Park Drive-Century Park Avenue	600,000	B&E	2
Industrial Park Extension Industrial Park-NC 66 South	550,000	E	2
Mountain Street (East & West) Bodenhamer Street-Inner Loop Road	750,000	C	2
Bodenhamer Street I-40-East Mountain Street	100,000	C	2
North Main Street Cherry Street-Inner Loop Road	200,000	C	2
Timber Wood Trail Extension Timber Wood Trail-Oakhurst Street	1,000,000	B	2
Lake Drive Extension Lake Drive-Hopkins Road	550,000	B	2
Inner Loop Road NC 66 South-West Mountain Street	2,000,000	A	3
East Pineview Road Extension Pineview Road-NC 66	80,000	A	3
Macy Grove Road Extension Old Greenboro Road-Main Street (NC 150)	1,100,000	E	3
Smith-Edwards Road Oak Ridge Road-Piney Grove Road	750,000	E	3
Linville Springs Road Extension Old Valley School Road-NC 66	1,750,000	E	3
Crestland Drive Extension Crestland Drive-Lower Gate Lane	450,000	B	3
Adams Street Extension Adams Street-Berry Garden Road	450,000	A	4
Berry Garden Road Extension Berry Garden Road-Main Street (NC 150)	600,000	E	4
Forest Drive Extension Forest Drive-Century Boulevard	425,000	B	4
Clifton Street Extension Clifton Street-West Mountain Street	150,000	B	4

*1979 dollars

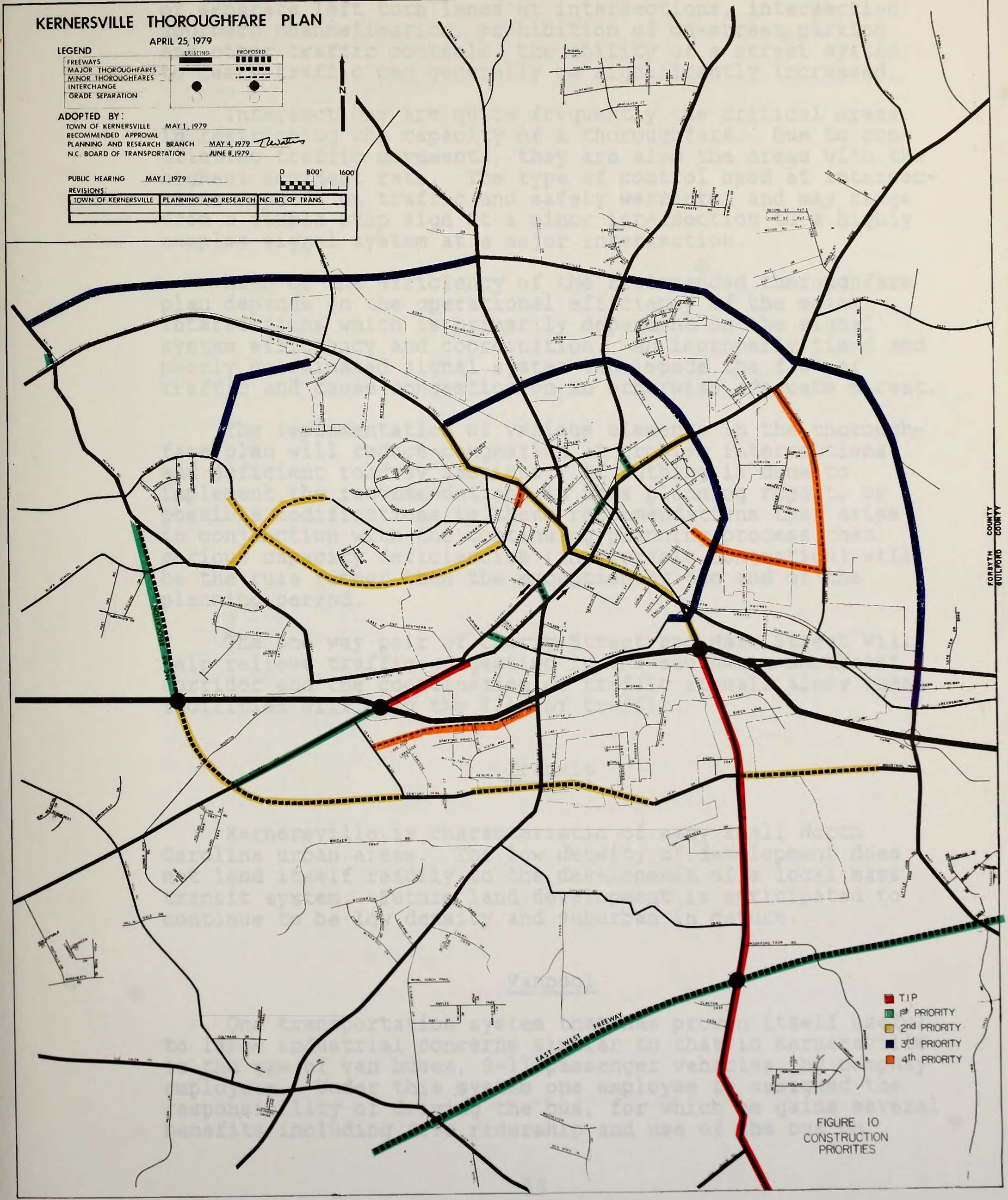


FIGURE 10
CONSTRUCTION
PRIORITIES

of separate left turn lanes at intersections, intersection approach channelization, prohibition of on-street parking and other traffic controls, the ability of a street system to carry traffic can generally be significantly increased.

Intersections are quite frequently the critical areas in restricting the capacity of a thoroughfare. Due to conflicting traffic movements, they are also the areas with the highest accident rate. The type of control used at intersections depends on traffic and safety warrants, and may range from a simple stop sign at a minor intersection to a highly complex signal system at a major intersection.

Much of the efficiency of the recommended thoroughfare plan depends on the operational efficiency of the major intersections which is primarily dependent on the signal system efficiency and coordination. An improperly timed and poorly coordinated signal system can impede the flow of traffic and cause congestion on an otherwise adequate street.

The implementation of various elements in the thoroughfare plan will reduce congestion at problem intersections and deficient roadway sections. If nothing is done to implement the recommendations in this planning report, or possible modifications to these recommendations that arise in conjunction with the continuing planning process then serious capacity deficiencies (intolerable congestion) will be the rule rather than the exception by the end of the planning period.

The one way pair of Cherry Street and Main Street will help relieve traffic congestion in the southwest-northeast corridor and the coordination of traffic signals along these facilities will help the flow of traffic.

Transit

Kernersville is characteristic of many small North Carolina urban areas. The low density of development does not lend itself readily to the development of a local mass transit system. Future land development is anticipated to continue to be low density and suburban in nature.

Vanpool

One transportation system that has proven itself useful to large industrial concerns similar to that in Kernersville is the use of van buses, 9-11 passenger vehicles, by compnay employees. Under this system one employee is assigned the responsibility of driving the bus, for which he gains several benefits including free ridership and use of the bus on weekends. The initial capital outlay is made by the company, and is returned to the company by the fares charged the employee passenger. Several programs currently underway have shown that it is economically feasible and that the employee-passenger is well satisfied by this service. Kernersville has industries which could contribute a suitable atmosphere for vanpooling. Some of these industries are: Adam-Millis and ITT Grinnell.

Carpool

Another method which could help raise vehicle occupancy would be an organized carpool program. Carpool programs have been implemented in several of the larger cities in North Carolina and many have established working carpool operations. The best results have been obtained by coordination with large local employers. The industries mentioned in the Vanpool section and other centers is the planning area presents an excellent opportunity to establish a carpool program.

VI. IMPLEMENTATION

There are several tools which are available for implementation of the thoroughfare plan. These tools are described in this chapter. More detail of Implementation of the adopted thoroughfare plan for Kernersville can be found in, The Implementation Study of Transportation Plans for Forsyth County.

State-Municipal Adoption of the Thoroughfare Plan

Chapter 136, Article 3A, Section 136-66.2 of the General Statutes of North Carolina provides that after development of the thoroughfare plan, the plan may be adopted by the governing body of the municipality and the Board of Transportation as the basis for future street and highway improvements. If mutually adopted, negotiations will begin to determine which of the existing and proposed thoroughfares will be a state responsibility and which will be a municipal responsibility. The municipality will not be expected to construct or maintain facilities which are designated a state responsibility; however, the municipality will share in the right of way costs with the municipality's share of the cost to be determined at time of construction. Kernersville has already adopted the recommended plan in this report.

Subdivision Control

A subdivision ordinance requires that every subdivider submit to the Town Planning Board a plot of his proposed subdivision. Certain standards must be met by the developer before he can be issued a building permit to construct his development. Through this process it is possible to reserve or protect the necessary rights of way for projected streets which are a part of the thoroughfare plan and to require street construction in accordance with the plan.

Facilities which could be implemented by subdivision control include:

(1) Hopkins Road Extension from I-40 to Century Park Avenue

(2) Timber Wood Trail Extension from Timber Wood Trail to Oakhurst Street

(3) Lake Drive Extension from Lake Drive to Hopkins Road

(4) Portions of the Inner Loop Road

(5) Crestland Drive Extension from Crestland Drive to Lowergate Lane

(6) Adams Street Extension from Adams Street to Berry Garden Road

(7) Berry Garden Road Extension from Berry Garden Road to Clay Flynt Road

(8) Forest Drive Extension from Forest Drive to Century Boulevard

Recommended standards and definitions for a subdivision ordinance are included in Appendix C.

Zoning

A zoning ordinance can be beneficial to thoroughfare planning in that planned locations of various land uses and planned densities of dwelling units can be realized. This provides a degree of stability on which to make future traffic projections and to plan streets and highways.

Other benefits of a good zoning ordinance are: (1) the establishment of standards of development which will aid traffic operations on major thoroughfares; (2) the minimization of strip commercial development which creates traffic friction and (3) the requirement for provision of off-street parking by new developers with the purpose of eventually prohibiting all curb parking on major thoroughfares.

Official Street Map

A municipality may, through special enabling legislation, adopt an official street map which indicates both existing and future street lines. No new construction or reconstruction of structures would be permitted within the designated future street lines. Over a period of time, this would reduce the cost of additional right of way along densely developed thoroughfares which will require widening at some future date.

Facilities in Kernersville which could benefit from enactment of a street map with specified set back distances are:

(1) NC 150 (Main Street) from Hopkins Road Extension to I-40

(2) NC 150 (Main Street) from Cherry Street to the Inner Loop.

(3) Mountain Street from Bodenhamer Street to the Inner Loop.

(4) Bodenhamer Street from Mountain Street to I-40.

Urban Renewal

Urban renewal is the term used to describe the removal of blight in cities. It is one of the few tools available for correcting basic mistakes in the existing pattern.

The urban renewal program is carried out under the framework of the Federal Housing Act of 1954, as amended, and consists of a three-fold attache on blight. It calls for the conservation of good areas of the cities, rehabilitation of declining areas and for the clearance of slum areas so that they may be redeveloped to good standards. If a municipality meets certain requirements as to a master plan, good codes and ordinances, citizen participation, it may obtain assistance in such a program from the Federal Government with the Government paying three-fourths of the cost of the project.

Capital Improvements Program

One of the tools which makes it easier to build a planned thoroughfare system is a capital improvements program. This is a long-range plan for the spending of money on street improvements, acquisition of rights of way, and other capital improvements within the bounds of projected revenues. Municipal funds should be available for construction of street improvements which are a municipal responsibility, right of way cost sharing on facilities designated a state responsibility, and advance purchase of right of way where such action is warranted.

SL/jc/dk

FOOTNOTES

1. Highway Capacity Manual, Highway Research Board Special Report 87, 1965, p. 5.

2. Ibid, p. 81-82.

APPENDICES

APPENDIX A - Thoroughfare Plan Street Tabulation and Recommendations

APPENDIX B - One-Way Street

APPENDIX C - Recommended Definitions and Design Standards for Subdivision Ordinances

FOOTNOTES

1. *Highway Capacity Manual*, Highway Research Board Special Report 87, 1965, p. 5.

2. *Ibid*, p. 81-82.

APPENDIX A TABLE I

THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

				Existing			Recommended		
Street	From	To	Length	Pavement	ROW	Volume	Pavement	ROW	Priority
Adams Street	NC 150	Adams Street Ext.	.39	20'-26'	-	-	-	-	-
Adams Street Ext.	Adams Street	Berry Garden Road	.66	-	-	-	A	70'	4
Berry Garden Road	Berry Garden Rd. Ext.	Graves Street	.32	20'	60'	-	-	-	-
Berry Garden Road Ext.	Berry Garden Road	Clay Flynt Road	.48	-	-	-	E	100'	4
Bethel Church Road	SR 2019	Oak Ridge Road (NC 150)	1.30	18'	60'	190	-	-	-
Bluff School Road	Hopkins Road	Study Boundary	1.40	20'	60'	370	-	-	-
Bodenhamer Street	I-40 Bridge	Ramp North of I-40	.03	24'	60'	13,000	C	70'	2
Bodenhamer Street	Ramp North of I-40	Mountain Street East	.17	40'	60'	13,000	C	70'	2
Bodenhamer Street	Mountain Street East	Main Street	.51	31'	-	7,700	-	-	-
Bodenhamer Street	Main Street	Old Valley School Rd.	.42	24'	-	-	-	-	-
Century Blvd.	Kernersville Rd. (NC 150)	Century Park Ave.	.42	32'-40'	-	-	-	-	-
Century Park Ave.	Century Blvd.	Park Ave. Ext. South	.33	32'	-	-	-	-	-
Cherry Street	Main Street	Mountain Street West	.71	26'	-	-	-	-	-
Cherry Street	Mountain Street East	Railroad Street	.24	23'	-	-	-	-	-
Cherry Street	Bodenhamer Street	Piney Grove Road	.11	24'	30'	-	-	-	-
Cherry Street Ext.	Railroad Street	Bodenhamer	.02	-	-	-	A	90'	1
Clay Flynt Road	Main Street (NC 150)	Berry Garden Road Ext.	.43	12'-15' Dirt	-	-	E	100'	4
Clifton Street	Oakhurst Street	Clifton Street Ext.	.17	20'	-	-	-	-	-
Clifton Street Ext.	Clifton Street	Mountain Street West	.09	-	-	-	B	70'	4
County Line Road	Main Street (NC 150)	Guilford County	.82	18'	60'	-	-	-	-
Crestland Drive	Crestland Drive Est.	Mountain Street West	.20	18'	60'	-	-	-	-
Crestland Drive Est.	Crestland Drive	Lowergate Lane	.52	-	-	-	B	70'	3
Dobson Street	Bodenhamer Street	Mountain Street West	.34	18'	60'	-	-	-	-
East-West Freeway	US 311 (Winston-Salem)	I-40 (East Kernersville)	9.54	-	-	-	F	250'	1
Forest Drive	Salisbury Street	Forest Drive Ext.	.17	20'	-	-	-	-	-
Forest Drive Ext.	Forest Drive	Century Boulevard	.61	-	-	-	B	70'	4
Graves Street	Berry Garden Rd.	Mountain Street East	.18	18'	60'	-	-	-	-
Hasting Hill Road	Old Salem Rd. Ext.	Kernersville Road (NC 150)	1.20	20'	60'	1,200	-	-	-
Hasting Hill Road	Kernersville Road (NC 150)	Old Salem Road West	1.51	20'	60'	1780	-	-	-
Hopkins Road	NC 66	Hopkins Road Ext.	.87	20'	60'	1200	-	100'	-
Hopkins Road	Old Winston Road	Hopkins Road Ext.	1.21	20'	60'	2700	-	-	-
Hopkins Road Ext.	Hopkins Road	I-40	.84	-	-	-	E	100'	1
Hopkins Rd. Ext.	I-40	Century Park Ave.	1.26	-	-	-	B	90'	2
I-40	Linville Road	Kernersville Rd. (NC 150)	4.03	48'	250'	39,600	-	-	-
I-40	Kernersville Rd. (NC 150)	NC 66 (South)	1.56	48'	250'	25,300	-	-	-
I-40	NC 66 (South)	Guilford County	1.51	48'	250'	33,800	-	-	-

				Existing			Recommended		
Street	From	To	Length	Pavement	ROW	Volume	Pavement	ROW	Priority
Nelson Street	Piney Grove Rd.	Mountain St West	.56	21'-26'	-	-	-	-	-
Oakhurst Street	Mountain Street West	Cherry Street	.57	26'	-	-	-	-	-
Old Greensboro Road West	NC 66	SR 2410	.37	22'	60'	-	-	-	-
Old Greensboro Road East	Mountain Street	Guilford County	.78	18'-20'	60'	1,200	-	-	-
Old Salem Road	Kernersville Road (NC 150)	Union Cross Road	3.26	18'-20'	60'	2,500	-	-	-
Old Salem Road	Union Cross Road	NC 66	2.35	18'-20'	60'	1,000	-	-	-
Old Valley School Road	Bodenhamer Street	Linville Springs Road	.94	17'-18'	60'	2,700	-	-	-
Old Valley School Road	Linville Springs Road	NC 66	3.22	17'-18'	60'	1,650	-	-	-
Old Winston Road	Cherry Street	Hopkins Road	.68	17'-18	60'	-	-	-	-
Park Drive South	NC 66	Park Drive Ext. South	.45	26'	-	-	-	-	-
Park Drive Ext. South	Park Drive South	Union Cross Road	.53	-	-	-	E	100'	2
Park Drive Ext. South	Union Cross Road	Century Park Ave.	.31	-	-	-	B	90'	2
Perry Road	Mountain Street	Study Boundary	.50	14'-22'	60'	-	-	-	-
Pineview Drive	Main Street	Pineview Road Ext. East	.82	18'-22	-	-	-	-	-
Pineview Drive Ext. West	Main Street	East Cherry Street	.09	-	-	-	A	70	1
Pineview Rd. East	Pineview Road	NC 66	.09	-	-	-	A	70	3
Piney Grove Road	Main Street	Vance Road	2.07	19'-20'	60'	4,500	-	-	-
Piney Grove Road	Vance Road	SR 2015	2.10	12'	60'	-	-	-	-
Piney Grove Road Ext.	Nelson Street	Main Street North	.10	-	-	-	A	90	1
Salisbury Street	Main Street	Center Street	.34	22'	60'	-	-	-	-
Salisbury Street	Center Street	I-40	.11	26'	60'	-	-	-	-
Salisbury Street	I-40	Shields Road	.74	19'	60'	3,500	-	-	-
Salisbury Street Ext.	Main Street	Cherry Street	.09	-	-	-	B	90'	1
Shields Road	NC 66	Union Cross Road	1.25	19'-21'	60'	1,000	-	-	-
Smith Edwards Road	Main Street (NC 150)	Macy Grove Road Ext.	.94	18' gravel	60'	200	E	100'	3
Smith Edwards Road Ext.	Oak Ridge Road	Piney Grove Road	.87	-	-	-	E	100'	3
Timberwood Trail	Hopkins Road	Timberwood Trail Ext.	.69	20'	-	-	-	-	-
Timberwood Trail Ext.	Timber Wood Trail	Oakhurst Street	1.47	-	-	-	B	70'	2
Union Cross Road	Shields Road	Old Salem Road	1.48	18'	60'	3,500	-	-	-
Union Cross Road	Old Salem Road	SR 2679	1.30	18'	60'	2,600	-	-	-
Vance Road	Piney Grove Road	SR 2020	1.60	18'	60'	-	-	-	-

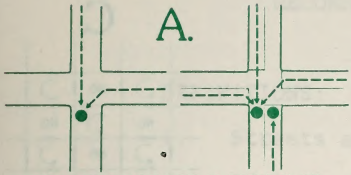
				Existing			Recommended		
Street	From	To	Length	Pavement	ROW	Volume	Pavement	ROW	Priority
Industrial Park	Macy Grove Road	Industrial Park Ext.	.17	20'	-	-	-	-	-
Industrial Park Ext.	Industrial Park	NC 66 (South)	.65	-	-	-	E	100'	2
Inner Loop Road	NC 66 South	Mountain Street West	2.42	-	-	-	C	90'	3
Kerner Road	Old Valley School Rd.	Crouse Road	.54	18'	60'	930	-	-	-
Kerner Road	Crouse Road	Vance Road	1.80	16'	60'	-	-	-	-
Kernersville Rd. (NC 150)	Old Salem Road	Hasting Hill Road	2.29	20'	60'	5,500	-	-	-
Kernersville Rd. (NC 150)	Hasting Hill Rd.	Hopkins Road Ext.	.58	20'	60'	6,500	-	-	-
Kernersville Rd. (NC 150)	Hopkins Rd. Ext.	I-40	.74	20'	60'	6,500	D	90'	1
Lake Drive	Oakhurst Street	Lake Dr. Ext.	.97	18'	60'	-	-	-	-
Lake Drive Ext.	Lake Drive	Hopkins Road	.65	-	-	-	B	70'	2
Linville Springs Rd.	Piney Grove Rd.	Old Valley School Rd.	.68	20'	60'	920	-	-	-
Linville Springs Rd. Ext	Old Valley School Rd.	NC 66	2.03	-	-	-	E	100'	3
Lower Gate Lane	Timber-Wood Trail	Crestland Drive Ext.	.90	20'	-	-	-	-	-
Macy Grove Rd.	Old Greensboro Rd.	Guilford County	1.19	20'	60'	900	-	-	-
Macy Grove Rd. Ext.	Old Greensboro Rd.	Smith Edwards Rd.	1.10	-	-	-	E	100'	3
Main Street North (NC 150)	Mountain Street	Bodenhamer St.	.25	36'	60'	9,000	-	-	-
Main Street North (NC 150)	Bodenhamer St.	Cherry Street	.12	27'	60'	14,000	-	-	-
Main Street North (NC 150)	Cherry Street	Inner Loop Road	.40	27'	60'	11,000	C	90'	2
Main Street North (NC 150)	Inner Loop Rd.	Bethel Chruch Rd.	1.65	20'	60'	5,700	-	-	-
Main Street North (NC 150)	Bethel Church Road	Guilford County	.45	20'	60'	2,700	-	-	-
Main Street South (NC 150)	Mountain Street East	Salisbury Street	.25	29'	60'	-	-	-	-
Main Street South (NC 150)	Salisbury Street	Pineview Drive	.25	23'	60'	9,000	-	-	-
Main Street South (NC 150)	Pineview Drive	Cherry Street	.23	23'-30'	60'	9,000	-	-	-
Main Street South (NC 150)	Cherry Street	I-40	.43	19'-30'	60'	11,200	D	90'	TIP
Mountain Street East (NC 66)	Cherry Street	Bodenhamer St.	.61	26'	60'	14,000	C	90'	2
Mountain Street East	Inner Loop Rd.	Old Greensboro Rd.	.74	22'	60'	8,000	-	-	-
Mountain Street East (US 421)	Old Greensboro Rd.	Guilford Rd.	.74	22'	100'	5,000	-	-	-
Mountain Street West (NC 66)	Cherry Street	Inner Loop Rd.	.82	26'	60'	12,200	C	90'	2
Mountain Street West (NC 66)	Inner Loop Road	Crestland Drive	.69	22'	60'	8,300	-	-	-
Mountain Street West (NC 66)	Crestland Drive	Hopkins Drive	1.31	22'	60'	6,700	-	-	-
NC 66 South	I-40 Bridge	SR 2611	2.80	20'-23'	60'	14,400	C	90'	TIP
NC 66 Extension	NC 66	Mountain Street West	.09	-	-	-	E	100'	1

APPENDIX B

ONE-WAY STREETS

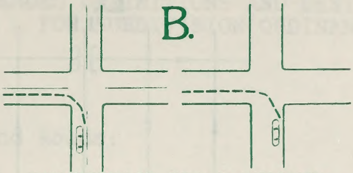
I. ADVANTAGES OF THE ONE-WAY SYSTEM

A.



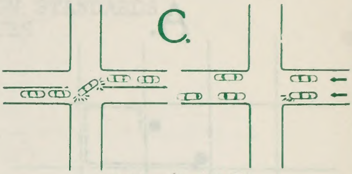
REDUCTION IN THE NUMBER OF VEHICULAR AND PEDESTRIAN CONFLICTS.

B.



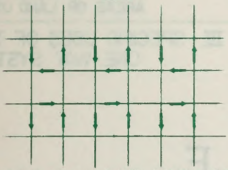
MORE EFFICIENT FOR TURNS AT INTERSECTIONS.

C.



HIGHER LANE CAPACITY

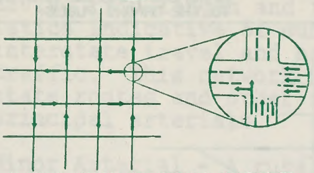
D.



EASIER TO COORDINATE SIGNALS IN A ONE-WAY SYSTEM

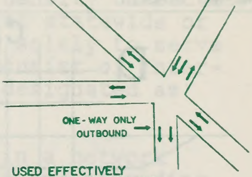
FOR A CONTINUOUS STREET, TRAFFIC SIGNAL COORDINATION IS IMPROVED GREATLY. FOR THE ENTIRE BLOCK SYSTEM IN THE CENTRAL AREA, IF BLOCK SPACING IS REASONABLY UNIFORM, IT IS POSSIBLE TO COORDINATE FOR ALL MOVEMENTS.

E.



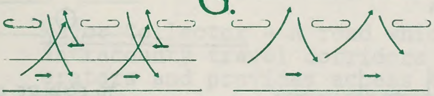
HANDLES HEAVY LEFT TURNING MOVEMENTS

F.



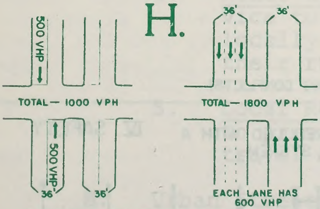
USED EFFECTIVELY TO ELIMINATE FIVE AND SIX SIDED INTERSECTIONS.

G.



LESS FRICTION FROM OFF-STREET PARKING AREAS, SERVICE STATIONS, EMERGENCY VEHICLES, ETC.

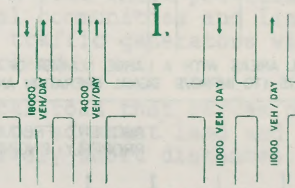
H.



INCREASES THE CAPACITY OF THE TRAFFIC SYSTEM WHERE STREET WIDTHS GIVE AN ODD NUMBER OF LANES.

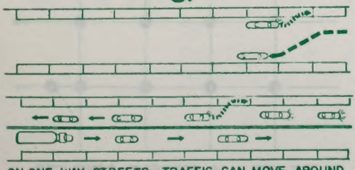
IN GENERAL, NARROWER LANES CAN BE USED. A 10 FOOT LANE ON A ONE-WAY STREET WILL HAVE AS MUCH CAPACITY AS 11 OR 12 FOOT LANES ON TWO-WAY STREETS.

I.



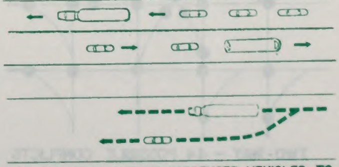
USED TO BALANCE THE TRAFFIC LOAD ON MAJOR RADIAL OR CROSSTOWN STREETS.

J.



ON ONE-WAY STREETS, TRAFFIC CAN MOVE AROUND PARKING OR DELIVERY VEHICLES.

K.

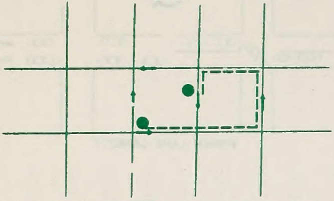


ONE-WAY PAIRS PERMIT PASSENGER VEHICLES TO PASS COMMERCIAL VEHICLES.

APPENDIX B (CONTINUED)

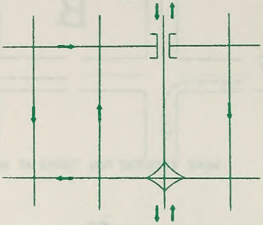
II. DISADVANTAGES OF THE ONE-WAY SYSTEM

A.



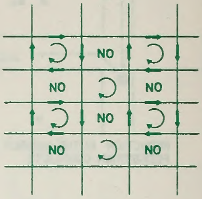
CERTAIN TRIPS MAY BE MADE LONGER BECAUSE OF THE ORIENTATION OF THE ONE-WAY STREETS.

B.



ONE-WAY STREET SYSTEMS, IF USED IMPROPERLY, CAN BE VERY CONFUSING TO THE DRIVING PUBLIC.

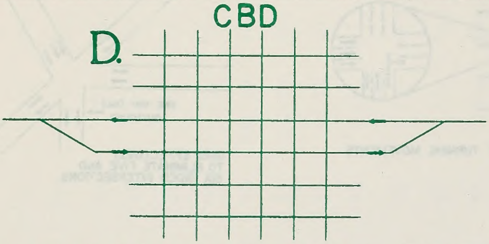
C.



MAY HAVE A DETRIMENTAL EFFECT ON SOME BUSINESS AREAS OR LAND USES.

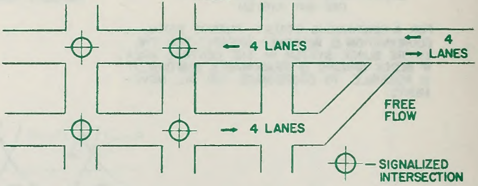
III. SPECIFIC USES OF THE ONE-WAY SYSTEM

D.



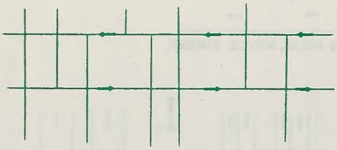
TO OBTAIN MORE CAPACITY FOR MAJOR RADIAL STREETS MOVING TO THE BUSINESS AREA.

E.



TO EQUALIZE CAPACITY IN THE CENTRAL AREA AT THE TERMINAL OF A FREE FLOWING RADIAL.

F.

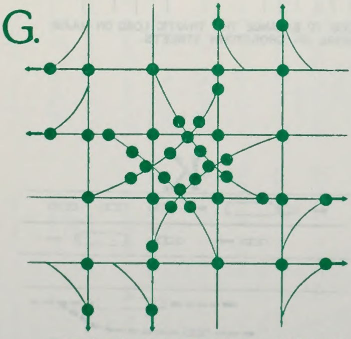


FOR CENTRAL AREAS WITH A LARGE NUMBER OF OFFSET INTERSECTIONS. (TO IMPROVE SIGNAL OPERATION AND REDUCE TURNING CONFLICTS)

IV. SAFETY

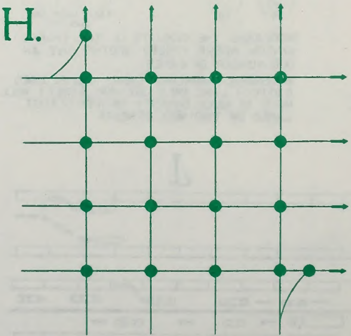
ACCIDENT FREQUENCY WILL BE REDUCED WITH A PROPERLY ENGINEERED ONE-WAY SYSTEM.

G.



TWO-WAY — 44 POSSIBLE CONFLICTS

H.



ONE-WAY — 18 POSSIBLE CONFLICTS

APPENDIX C

RECOMMENDED DEFINITIONS AND DESIGN STANDARDS FOR SUBDIVISION ORDINANCES

DEFINITIONS:

I. Streets and Roads:

A. Rural Roads

1. Principal Arterial - A rural link in a network of continuous routes serving corridor movements having trip length and travel density characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.

2. Minor Arterial - A rural link in a network joining cities and larger towns and providing intrastate and intercounty service at relatively high overall travel speeds with minimum interference to through movement. This network would primarily serve traffic.

3. Major Collector - A road which serves major intracounty travel corridors and traffic generators and provides access to the Arterial system.

4. Minor Collector - A road which provides service to small local communities and links the locally important traffic generators with their rural hinterland.

5. Local Road - A local road that serves primarily to provide access to adjacent land and for travel over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of Interstate, other freeway, expressway, or parkway links, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - Minor thoroughfares are important streets in the city system and perform the function of collecting traffic from local access streets and carrying it to the Major Thoroughfare system. Minor thoroughfares may be used to supplement the Major Thoroughfare system by facilitating a minor through-traffic movement and may also serve abutting property.

3. Local Street - A local street is any link not on a higher-order urban system and serves primarily to provide direct access to abutting land and access to higher systems.

C. Specific Type Rural or Urban Streets

1. Freeway, expressway, or parkway - Divided multilane roadways designed to carry large volumes of traffic at relatively high speeds. A freeway is a divided highway providing for continuous flow of vehicles with no direct access to abutting property or streets and with access to selected crossroads provided via connecting ramps. An expressway is a divided highway with full or partial control of access and generally with grade separations at major intersections. A parkway is a highway for noncommercial traffic, with full or partial control of access, and usually located within a park or a ribbon of parklike development.

2. Residential Collector Street - A local access street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. Local Residential Street - Cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. Cul-de-sac - A short street having but one end open to traffic and the other end being permanently terminated and a vehicular turn around provided.

5. Frontage Road - A local street or road that is parallel to a full or partial access controlled facility and functions to provide access to adjacent land.

6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot - A portion of a subdivision, or any other parcel of land, intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

1. Corner Lot - A lot abutting upon two streets at their intersection.

2. Double-Frontage Lot - A continuous (through) lot which is accessible from both of the parallel streets upon which it fronts.

3. Reverse-Frontage Lot - A continuous (through) lot which is accessible from only one of the parallel streets upon which it fronts.

III. Subdivision

A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, whether immediate or future, of sale or building development, and all divisions of land involving the dedication of a new street or a change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or recombination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than five acres where no street right-of way dedication is involved; (3) the public acquisition by purchase of strips of land for the widening or opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than two acres into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. Since a transfer of property is involved, the dedication is made by written instrument and is completed with an acceptance.

D. Reservation - A reservation of land does not involve any transfer of property rights. It simply constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

I. Streets and Roads:

The design of all streets and roads within Kernersville shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHO) manuals.

The provision of street rights-of-way shall conform and meet the requirements of the thoroughfare plan for Kernersville as approved by the city and adopted by the city and the North Carolina Board of Transportation.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

The urban planning area shall consist of that area within the urban planning boundary as depicted on the mutually adopted Kernersville Thoroughfare Plan.

The rural planning area shall be that area outside the urban planning boundary.

A. Right-of-Way Widths: Right-of-way widths shall not be less than the following and shall apply except in those cases where right-of-way requirements have been specifically set out in the Kernersville Thoroughfare Plan.

	Min. Right of Way, Ft.
1. Rural	
a. Principal Arterial	
Freeways	350
Other	200
b. Minor Arterial	100
c. Major Collector	100
d. Minor Collector	100
e. Local Road	*60

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*The desirable minimum right-of-way is 60 feet. If curb and gutter is provided, 50 feet of right-of-way is adequate on local residential streets.

		Min. Right of Way, Ft.
2.	Urban	
	a. Major Thoroughfare Other than Freeway and Expressway	90
	b. Minor Thoroughfare	70
	c. Local Street	*60
	d. Cul-de-sac	**Variable

The subdivider will only be required to dedicate a maximum of 100 feet of right-of-way. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. In all cases in which right-of-way is sought for an access controlled facility, the subdivider will only be required to make a reservation.

A partial width right-of-way, not less than sixty (60) feet in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths: Widths for street and road classifications other than local shall be as required by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

a. Local Residential
Curb and gutter section - 26 feet, to face of curb
Shoulder section - 20 feet to edge of pavement, 4 foot shoulders

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*The desirable minimum right-of-way is established as 60 feet. If curb and gutter is provided, 50 feet of right-of-way is adequate.

**The right-of-way dimension will depend on radius used for vehicular turn-around. Distance from edge of pavement of turn around to right-of-way should not be less than distance from edge of pavement to right-of-way on street approaching turn-around.

b. Residential Collector

Curb and gutter section - 34 feet, face to face of curb

Shoulder Section - 20 feet to edge of pavement, 6 foot shoulders

C. Geometric Characteristics: The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. Design Speed

The design speeds for subdivisions type streets shall be:

	Desirable	(Minimum) Level	Rolling	Mountainous
Rural				
Minor Collector Roads	60	(50)	(40)	(30)
Local Roads including Residential Collectors and Local Residential	50	(50)*	(40)*	(30)*
Urban				
Major Thoroughfares Other than Freeway or Expressway	60	(50)	(50)	(50)
Minor Thoroughfares	60	(50)	(40)	(40)
Local Streets	40	(40)**	(30)**	(20)**

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*Based on projected annual average daily traffic of 400-750. In cases where road will serve a very limited area and small number of dwelling units, minimum design speeds can be reduced further.

**Based on projected annual average daily traffic of 50-250.

2. Maximum and Minimum Grades

a. The maximum grades in percent shall be:

Design Speed	Level	Rolling	Mountainous
60	3	4	6
50	4	5	7
40	5	6	8
30		9	10
20			12

b. A minimum grade for curbed streets normally should not be less than 0.5%, a grade of 0.35% may be allowed where there is a high type pavement accurately crowned and in areas where special drainage conditions may control.

c. Grades for 100 feet each way from intersections should not exceed 5%.

d. For streets and roads with projected annual average daily traffic less than 250, short grades less than 500 feet long, may be 150% greater.

3. Minimum Sight Distances

In the interest of public safety, no less than the minimum sight distance applicable shall be provided in every instance. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters. (General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case):

DESIGN SPEED, MPH	20	30	40	50	60
Stopping Sight Distance -					
i. Min. Stopping Distance, Ft.	150	200	275	350	475
Des. Stopping Distance, Ft.	150	200	300	450	650
ii. Min. K* Value For:					
a. Min. Crest Vert. Curve	16	28	55	85	160
Des. Crest Vert. Curve	16	28	65	145	300
b. Min. SAG Vert. Curve	24	35	55	75	105
Des. SAG Vert. Curve	24	35	60	100	155
Passing Sight Distance -					
i. Min. Passing Distance, Feet (2 lane)		1100	1500	1800	2100
ii. Min. K* Value For Crest Vertical Curve		365	686	985	1340

Sight distance provided for stopped vehicles at intersections should be in accordance with, "A Policy on Geometric Design of Rural Highways".

4. The following table shows the maximum degree of curve and related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads wth no curb and gutter is .08. The maximum rate of superelevation for urban streets with curb and gutter is .06 with .04 being desirable.

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*K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve which will provide minimum sight distance.

Design Speed MPH	Maximum e*	Minimum Radius (Rounded) Feet	Maximum Degree of Curve (Rounded) Degrees
20	.04	125	45.0
30	.04	300	19.0
40	.04	560	10.0
50	.04	925	6.0
60	.04	1410	4.0
20	.06	115	50.0
30	.06	275	21.0
40	.06	510	11.5
50	.06	830	7.0
60	.06	1260	4.5
20	.08	110	53.5
30	.08	250	23.0
40	.08	460	12.5
50	.08	760	7.5
60	.08	1140	5.0

*e = rate of roadway superelevation, foot per foot

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty (60) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Off-set intersections are to be avoided unless exception is granted by the Divison of Highways. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

E. Cul-de-sacs

Cul-de-sacs, unless exception is granted by the local planning board, shall not be more than five hundred (500) feet in length. The distance from the edge of pavement on the vehicular turn-around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn-around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provision is made for service access.

   Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.
2. The width of an alley shall be at least twenty (20) feet.

3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn-around facilities at the dead-end as may be approved by the Planning Board.

4. Sharp changes in alignment and grade shall be avoided.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the nearest District Engineer of the Divison of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

I. Wheel Chair Ramps

In accordance with Chapter 136, Article 2A, §136-44.14, all street curbs in North Carolina being constructed or re-constructed for maintenance procedures, traffic operations, repairs, correction of utilities, or altered for any reason after September 1, 1973, shall provide wheelchair ramps for the physically handicapped at all intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Wheelchair ramps and depressed curbs shall be constructed in accordance with details contained in the Department of Transportation, Divison of Highways, Publication entitled, "Guidelines, Curb Cuts and Ramps for Handicapped Persons".

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and re-constructed bridges serving 2 lane, 2-way traffic should be as follows:

   a. Shoulder Section Approach

      i. Under 800 ADT Design Year
      Minimum 28 feet width face to face of parapets of rails or pavement width plus 10 feet, whichever is greater.

      ii. 800-2000 ADT Design Year
      Minimum 34 feet width face to face of parapets or rails or pavement width plus 12 feet, whichever is greater.

      iii. Over 2000 ADT Design Year
      Minimum 40 feet
      Desirable 44 feet width face to face of parapets or rails.

   b. Curbs and Gutter Approach

      i. Under 800 ADT Design Year
      Minimum 24 feet face to face of curbs.

      ii. Over 800 ADT Design Year
      Width of approach pavement measured face to face of curbs.

   Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be 1'-6" minimum, or greater if sidewalks are required.

2. The clear roadway widths for new and re-constructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

   a. Shoulder Section Approach -
      Width of approach pavement plus width of usable shoulders on the approach left and right.
      Min. 8'
      Des. 10'
   b. Curb and Gutter Approach - Width of approach pavement measured face to face of curbs.

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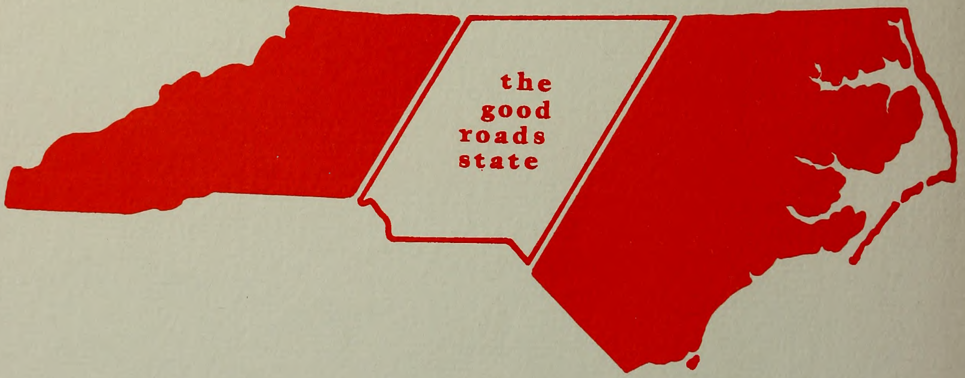
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